176

SERVICE MANUAL

AKAI SURROUND STEREO TAPE DECK

MODEL 280D-SS

AKAI 280D-SS

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**WHEN PLACING ORDER FOR PARTS,
PLEASE USE SEPARATE PARTS LIST.**

1. SPECIFICATIONS

STYLE : Portable
WEIGHT : 21.5 Kg (47.3 lbs)
DIMENSIONS : 435(W) x 505(H) x 250(D) mm
(17.4" x 20.2" x 10")
POWER SUPPLY : 100 V to 240 V AC 50/60 Hz
POWER CONSUMPTION
: 40 to 140 W
PLAYBACK AND RECORDING SYSTEM
: 4-track 4-channel/2-channel compatible
Stereo recording and playback
TAPE SPEED : 7-1/2 and 3-3/4 ips
TAPE SPEED DEVIATION
: Within $^{+1.0\%}_{-0.5\%}$ at 7-1/2 ips (FWD/REV)
Within ±1.0% at 3-3/4 ips (FWD/REV)
WOW AND FLUTTER (PLAYBACK ONLY)
: Less than 0.12% R.M.S. at 7-1/2 ips
Less than 0.18% R.M.S. at 3-3/4 ips
FREQUENCY RESPONSE
: 30 to 22,000 Hz ±3 dB at 7-1/2 ips
30 to 13,000 Hz ±3 dB at 3-3/4 ips
EQUALIZATION : Correct equalization for playback
of tapes recorded to the NAB curve
SIGNAL TO NOISE RATIO
: Better than 48 dB at 7-1/2 ips (FWD/REV)
Better than 46 dB at 3-3/4 ips (FWD/REV)
DISTORTION (TOTAL HARMONICS)
: Less than 2% at 1,000 Hz 0 VU recording
(7-1/2 ips)
Less than 3% at 1,000 Hz 0 VU recording
(3-3/4 ips)
CROSS-TALK : Better than 45 dB (2 CH)
Better than 40 dB (4 CH)
ERASE RATIO : Better than 70 dB
INSULATION RESISTANCE
: More than 50 MΩ
INSULATION DURABILITY
: 1,000 V AC for more than one minute
duration
OUTPUT
LINE OUTPUT : 4-channel +4 dB (1,228 V) ±1.5 dB
at 0 VU indication,
250 Hz 0 VU recorded tape.
2-channel +4 dB ±1 dB (FWD) ±1.5 dB (REV)
at 0 VU indication when using a
250 Hz recorded tape.
Required load impedance more than 25 KΩ
DIN OUTPUT : 0.4 V (Impedance 10 KΩ)
HEAD PHONE OUTPUT
: 30 to 40 mV /8 Ω

INPUT
LINE INPUT : Above 0.1 V (Impedance 150 KΩ)
MIC INPUT : Above 0.5 mV (Impedance 10 KΩ)
DIN INPUT : High . . . Above 60 mV
(Impedance 70 KΩ)
Low . . . Above 10 mV
(Impedance 70 KΩ)
FAST-FORWARD & REWIND TIME
: 83 seconds for a full 1,200 ft.
tape at 50 Hz
68 seconds for a full 1,200 ft.
tape at 60 Hz
MONITOR SYSTEM
: Program being recorded can be
monitored through stereo headphons.
External speakers or external main
amplifier.
MOTOR
CAPSTAN MOTOR
: Servo control 2-speed motor
condenser capacity 3.5 μ F (50 Hz)
3.0 μF (60 Hz)
Revolutions : 7-1/2 ips 520 r.p.m
3-3/4 ips 260 r.p.m
REEL MOTOR : Two 6-pole eddy current outer-rotor
motors
Condenser capacity 4.0 μF (50 Hz)
3.0 μF (60 Hz)
Revolutions : 930 r.p.m at 50 Hz 100 V
1120 r.p.m at 60 Hz 110 V
BIAS FREQUENCY
: 100 to 110 KHz
HEADS
RECORDING HEAD
: In-line 4-track 4-channel/2-channel
stereo
Impedance 125Ω ±20% at 1,000 Hz
Gap 4/1000 mm
PLAYBACK HEAD
: In-line 4-track 4-channel/2-channel
stereo
Impedance 1,200 Ω ±15% at 1,000 Hz
Gap 2/1000 mm
ERASE HEAD (A)
: In-line 4-track 2-channel stereo
Impedance 195 Ω ±10% 110 KHz
ERASE HEAD (B)
: In-line Full track
Impedance 350 Ω ±10% at 110 KHz
RECORDING LEVEL INDICATOR
: Two Vertical twin type VU meters

TRANSISTORS USED	2SC458LG (C)	20
	2SC945 (Q) (R)	18
	2SC711 (E) (D) or 2SC536 (E) (F)	12
	2SC968 (2) (3)	4
	2SC911 (2) (3)	2
	2SC968 (3)	2
	2SA564 (R)	2
	2SD234 (Y)	2
	2SC968	1
	2SC711 (G) (F) or 2SC536 (G) (H)	1
	2SC945 (R) (S)	1
	2SC1013	1
	2SC968 (3) (4)	1
I C USED	LD-3141	4
DIODES USED	IN34A	32
	10D1	15
	10D4	2
	RD9A	1
	10DC-1 (RED)	1
	10DC-1 (BLK)	1

REEL CAPACITY : 7", 5" reels can be used.

RECORDING CAPACITY
: 2-channel stereo 2-hours (1,200 ft, tape 3-3/4 ips)
4-channel stereo 1-hours (1,200 ft, tape 3-3/4 ips)

II. MEASURING METHOD

TAPE SPEED DEVIATION

1. Method involving use of pre-recorded tape

Playback a tape pre-recorded at 1,000 Hz (±0.1%) on the recorder to be tested. Connect the appropriate output to a frequency counter meter in order to measure the tape speed deviation.

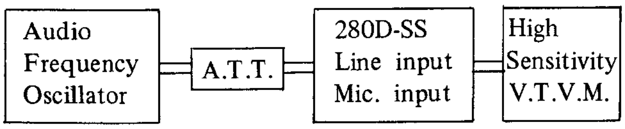
2. Method involving use of timing tape (designed for tape speed measurement)

This method utilizes a timing tape marked at intervals of 7-1/2". The running time of over 60 marked sections of the tape is measured in order to calculate the tape speed deviation. In applying this method, however, it should be kept in mind that timing tape stretch or contract measurement is inevitable, so that it is necessary to measure the total length of the tape in advance.

WOW AND FLUTTER

Playback a 3,000 Hz pre-recorded tape of which the wow and flutter level is guaranteed to be smaller than 0.07% for measurement by means of a wow meter. It is also possible for a 3,000 Hz sine wave to be recorded and played back for measurement by means of a wow meter. In this case, however, the wow meter indicates a value as much as twice the value given in the specifications.

FREQUENCY RESPONSE



Connect the measuring instruments as shown in the above diagram, and measure the frequency response in the following sequence.

RECORD :

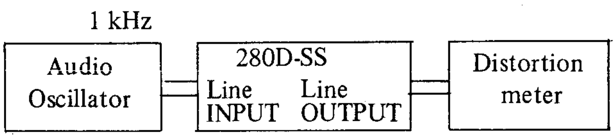
1) Supply a 1,000 Hz sinewave to the Line Input of the recorder to be tested through an attenuator from an audio frequency oscillator.
2) Set the Monitor Switch to "SOURCE" position and adjust the line input volume so that the VU Meter needle indicates "0" VU.
3). Set the TAPE SPEED SELECTOR to 7-1/2" or 3-3/4" position.
4) Under the condition described in (2), lower the input level 20 dB by means of the attenuator.
5) Record the spot frequency in the range of 30 Hz to 20,000 Hz from the audio frequency oscillator.

PLAYBACK :

6) Set the Monitor Switch to "TAPE" position.
7) Connect a High Sensitivity V.T.V.M. to the Line Output Jack. (VTVM with millivolt scale.)
8) Playback the recorded tape.
9) Playback the recorded spot frequencies and make a memo of output level and plot the value on a graph. With 1,000 Hz frequency as standard (0 dB), read other frequency indications.

Note : Frequency response shown in specifications represent values when using AKAI "100F" (FUJI S-100) Tape.

TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instrument as shown above, and record a 1,000 Hz sine wave at "0" VU. Playback the resulting signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed ; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.

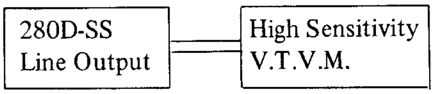
The required distortion factor can be obtained from the results of the above measurement by using the following formula :

$$d_0 = d - d_1 - d_2$$

Where, d_0 = Required
d = Overall distortion factor
d_1 = Noise level
d_2 = Distortion factor of the oscillator

Note : New tape of particularly good quality should be used for measurement of the distortion factor. AKAI "100L" (FUJI S-100) is recommended.

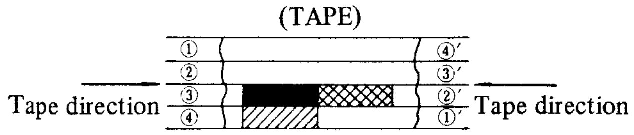
SIGNAL TO NOISE RATIO



Set the Tape Speed Selector to "7-1/2 ips" position and playback a tape containing a 250 Hz sine wave recorded at "0" VU level on a standard recorder. Connect a High sensitivity V.T.V.M. to the line output jack of the recorder and measure its output. Then remove the tape and measure the noise level under the same condition. Convert into decibels each of the measured values.

CROSS TALK

1. Between the tracks (2-Channel)

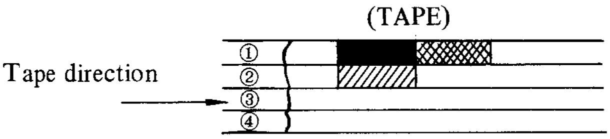


As shown in the figure, first record a 1,000 Hz sine wave on track No. 3 at +3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition. Then, playback the tape on tracks 3 and 1 (reversed condition of tape) through the 1,000 Hz B.P.F. (Band Pass Filter, Sensitivity . . . 1 : 1) and obtain the ratio between the two by using the following formula.

$$C = 20\,log \frac{E_0}{E_2 - E_1}\ (\text{dB})$$

C = Desired cross talk ratio (dB)
E_0 = 1,000 Hz signal output level ■
E_2 = 1,000 Hz cross talk output level ▨
E_1 = Non-input signal record level ▩

2. Between the channels (4-Channel)



As shown in the figure, first record a 1,000 Hz sine wave on track No. 1 at +3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition.

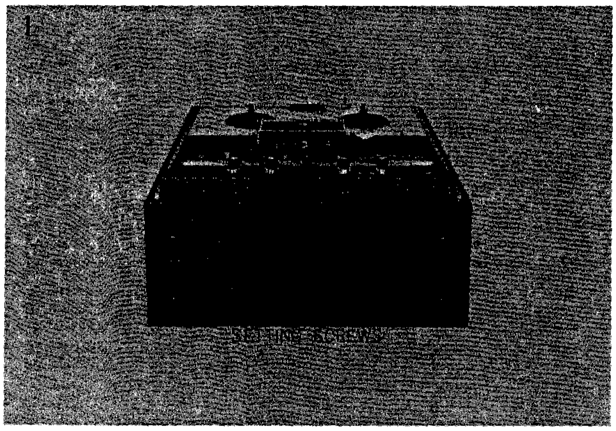
Then, playback the tape on track No. 1 and No. 2 through the 1,000 Hz B.P.F. (Band Pass Filter, Sensitivity . . . 1 : 1) and obtain a ratio between the two from the following formula.

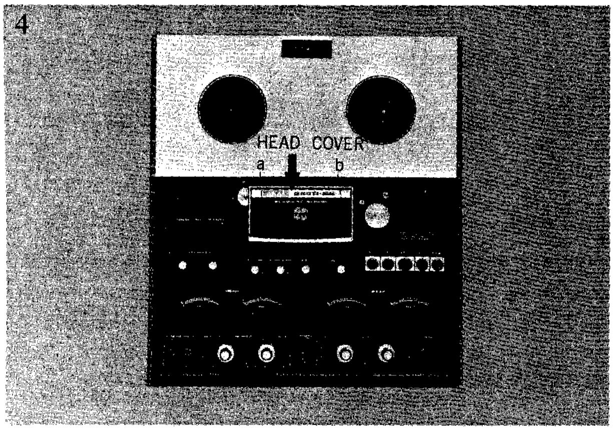
$$C = 20\,log \frac{E_0}{E_2 - E_1}\ (\text{dB})$$

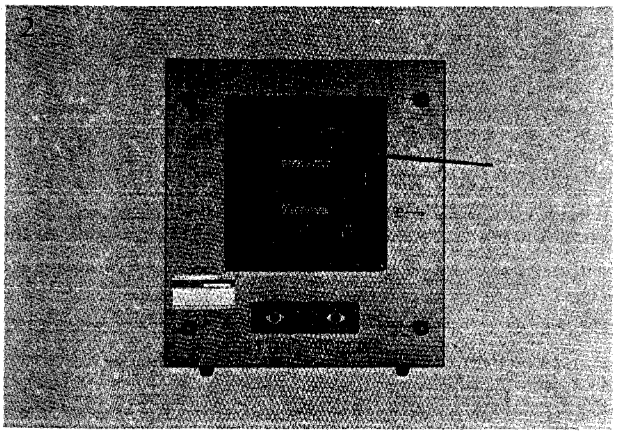
C = Desired cross-talk ratio (dB)
E_0 = 1,000 Hz signal output level ■
E_2 = 1,000 Hz cross-talk output level ▨
E_1 = Non-input signal record level ▩

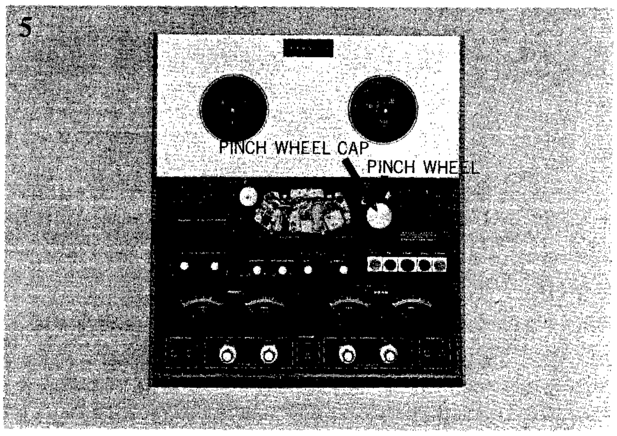
III. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIER

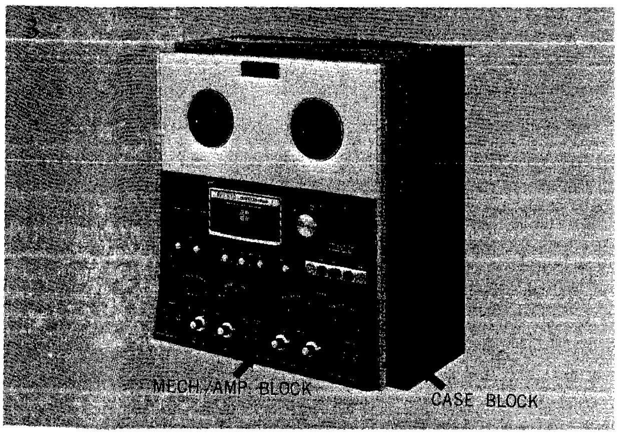
In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.

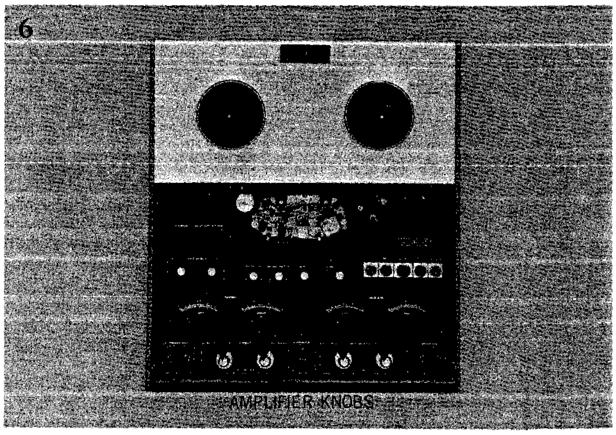

1
SETTING SCREWS

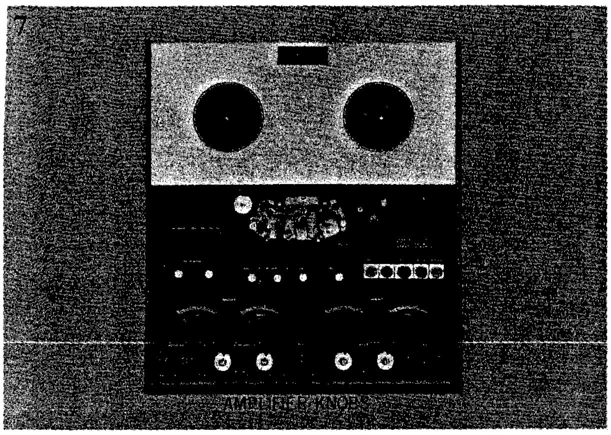

4
HEAD COVER
a
b




5
PINCH WHEEL CAP
PINCH WHEEL


3
MECH./AMP. BLOCK
CASE BLOCK


6
AMPLIFIER KNOBS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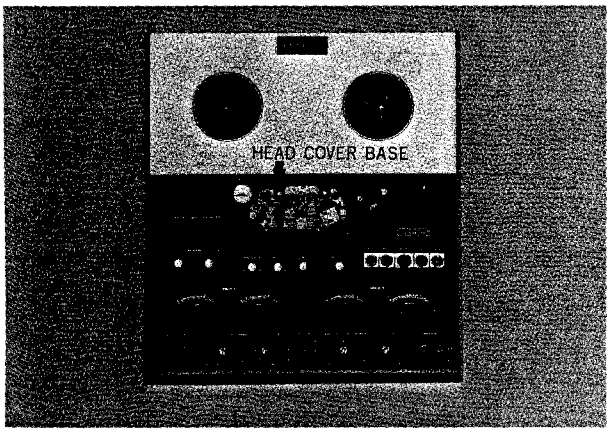
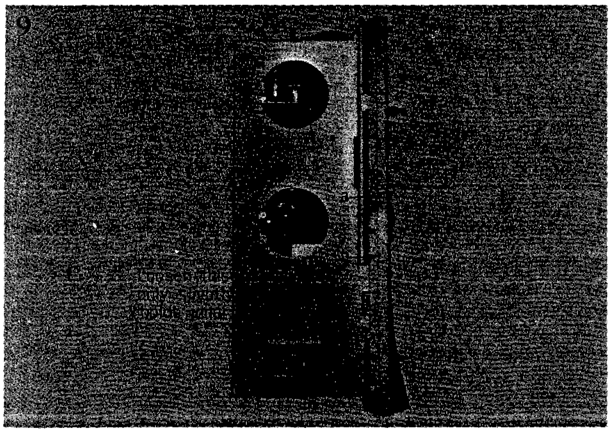
AMPLIFIER KNOBS


8
HEAD COVER BASE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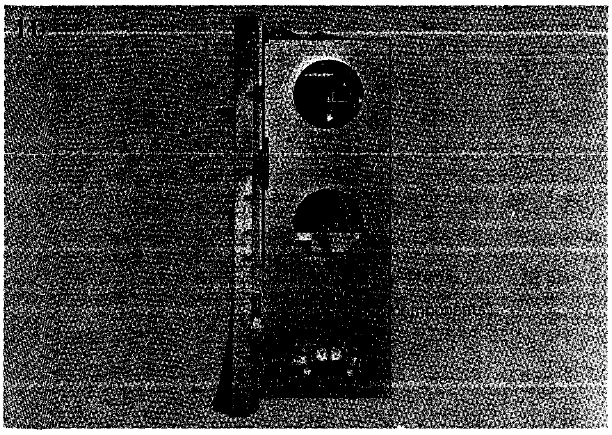
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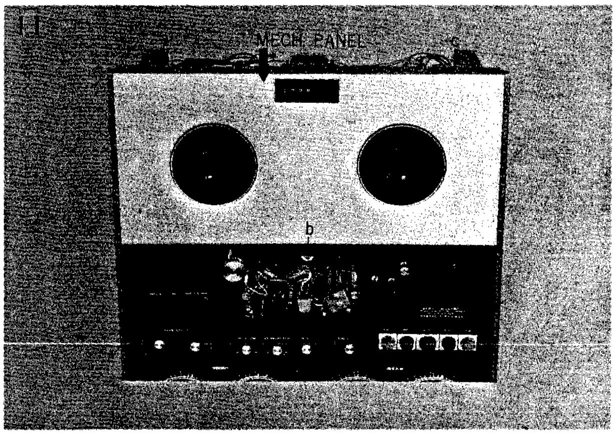
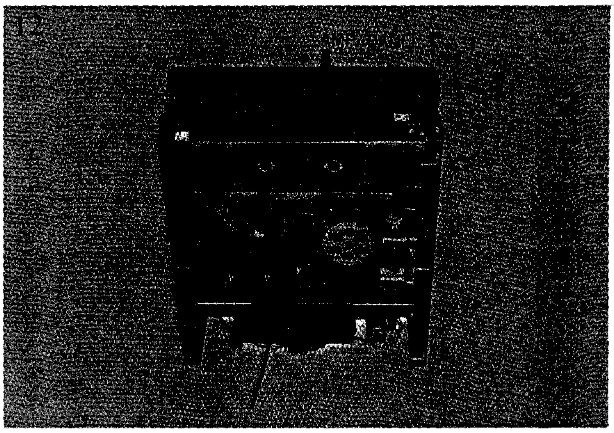

11
MECH. PANEL
b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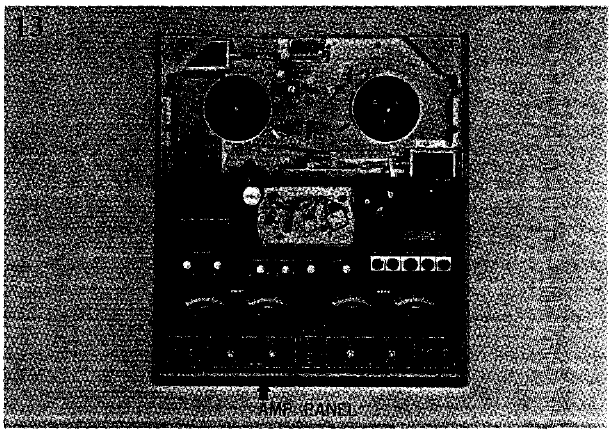
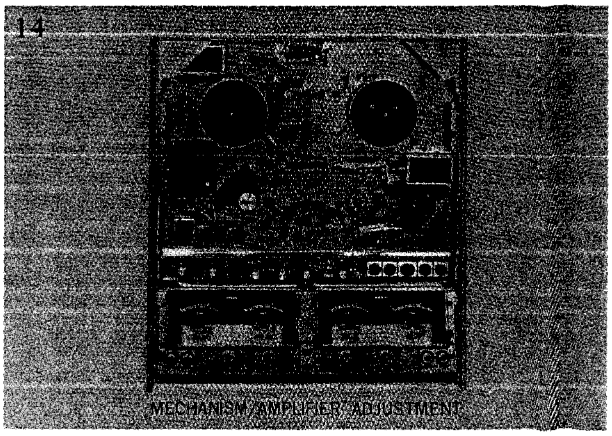

13
AMP. PANEL


14
MECHANISM/AMPLIFIER ADJUSTMENT

IV. TRANSPORT MECHANISM

1. SUPPLY VOLTAGE OF BOTH TORQUE MOTORS

	SUPPLY MOTOR	TAKE-UP MOTOR
Forward Playback	30 V	55 V
Reverse Playback	55 V	30 V
F.F.	100 V	12 V
RWD	12 V	100 V

Fig. 1

NOTE : These voltages values are approximate.

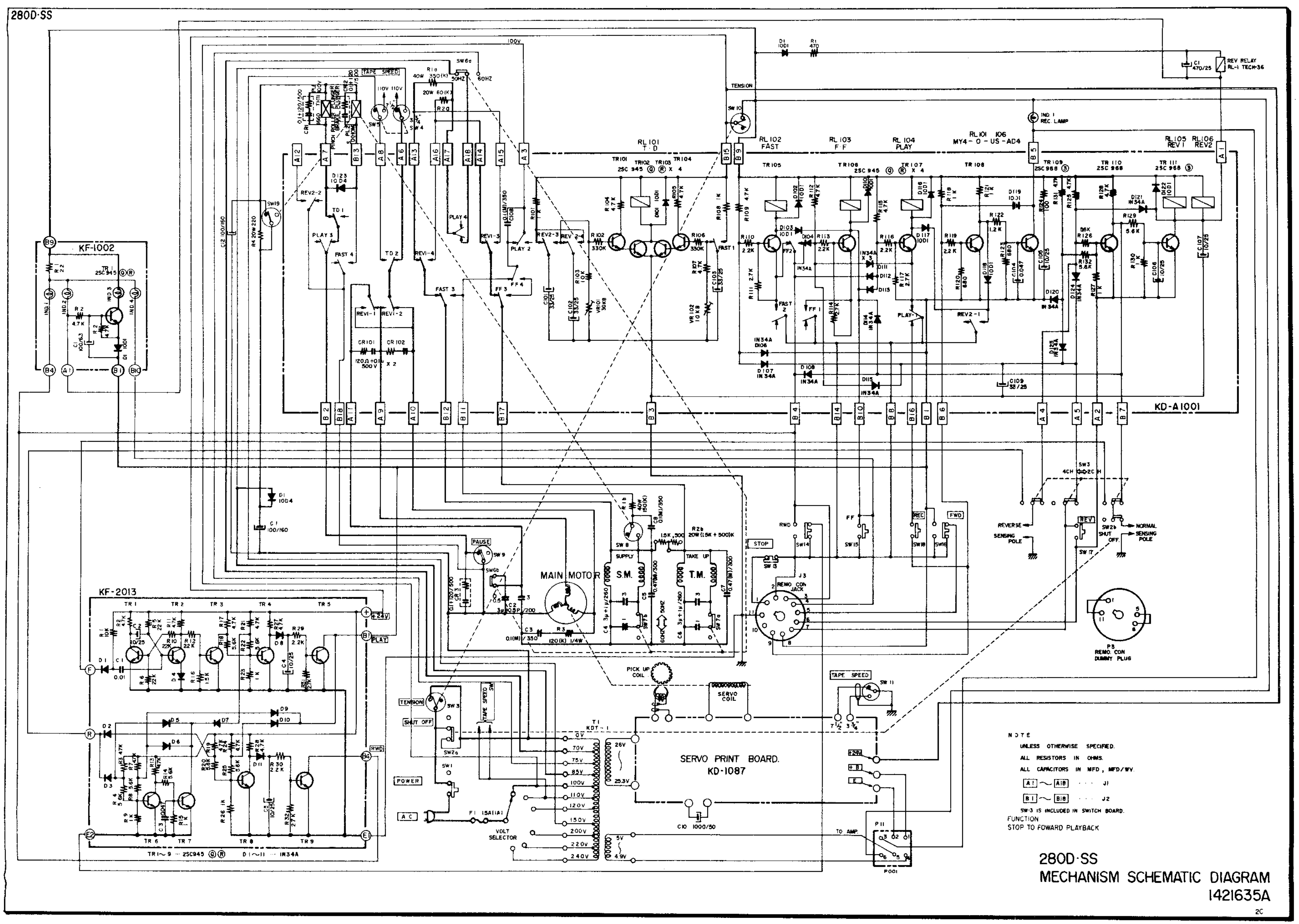
2. PINCH ROLLER PRESSURE

Proper pinch roller pressure is 1.2 kg (±100 gr)

3. TRANSISTOR AND RELAY OPERATION CHART

Relay Mode	PLAY	REV. 1	REV. 2	F.F	FAST	T.D	TRANSISTOR
FORWARD	○						TR107, TR110
REV	○	○	○				TR107, TR111
F. FWD				○	○		TR105, TR106
RWD					○		TR105
FWD to REV	○	○	○			○	TR101, TR102, TR107, TR111
REV to FWD	○					○	TR101, TR102, TR107, TR110
F. FWD or RWD to FORWARD	○					○	TR103, TR104, TR107, TR110
F. FWD or RWD to REV	○	○	○			○	TR103, TR104, TR107, TR111

Fig. 2


280D·SS
KD-A1001
KF-1002
KF-2013
SERVO PRINT BOARD.
KD-1087
MAIN MOTOR
S.M.
T.M.
SUPPLY
TAKE UP
PICK UP COIL
SERVO COIL
REMO. CON JACK
J3
P3
REMO. CON DUMMY PLUG
REV RELAY RL-1 TECH-36
RL 101 T·D
RL 102 FAST
RL 103 F F
RL 104 PLAY
RL101 106 MY4 - O - US - AD4
RL 105 REV 1
RL 106 REV2
IND 1 REC LAMP
TENSION
TAPE SPEED
PAUSE
STOP
REC
FWD
RWD
FF
REV
SHUT OFF
POWER
A C
VOLT SELECTOR
F1 15A(1A)
T1 KDT-1
TO AMP.
P11
P001
REVERSE SENSING POLE
NORMAL SENSING POLE
TR1~9 ··· 2SC945 Ⓠ Ⓡ
D1~11 ··· IN34A

NOTE

UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS IN OHMS.

ALL CAPACITORS IN MFD, MFD/WV.

A1 ~ A18 ···· J1

B1 ~ B18 ···· J2

SW-3 IS INCLUDED IN SWITCH BOARD.

FUNCTION
STOP TO FOWARD PLAYBACK

280D·SS
MECHANISM SCHEMATIC DIAGRAM
1421635A
2C

Fig. 3

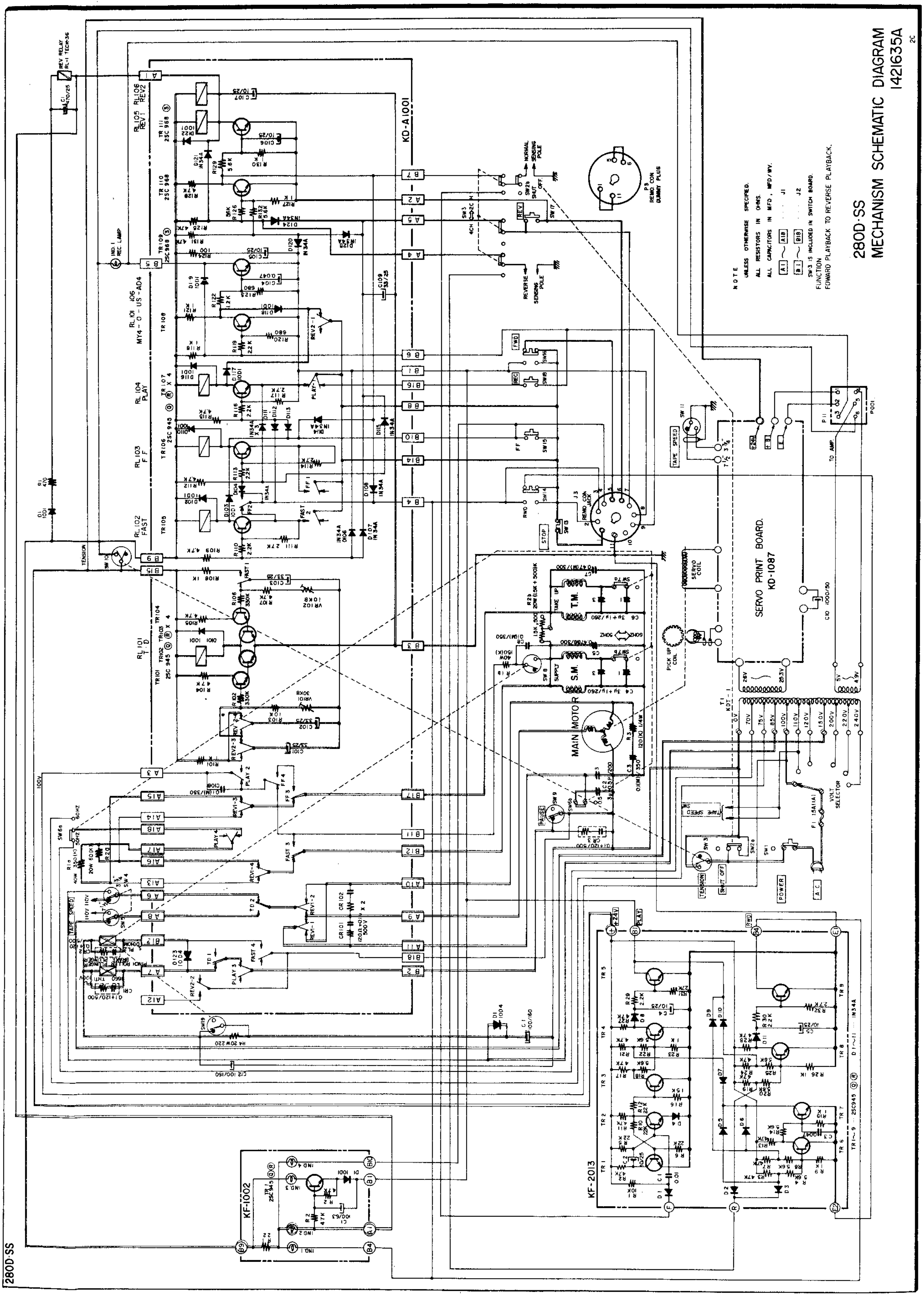

280D·SS
MECHANISM SCHEMATIC DIAGRAM
1421635A
2C
NOTE
UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS IN OHMS.
ALL CAPACITORS IN MFD, MFD/WV.
A1 ~ A18 . . . J1
B1 ~ B18 . . . J2
SW-3 IS INCLUDED IN SWITCH BOARD.
FUNCTION
FOWARD PLAYBACK TO REVERSE PLAYBACK.
KD-A1001
SERVO PRINT BOARD.
KD-1087
KF-2013
KF-1002
MAIN MOTOR
T.M.
S.M.
REV RELAY
RL-1 TECH-36
280D·SS

Fig. 4

4. FROM STOP TO FORWARD PLAYBACK (RECORDING) (See Figs. 1, 2, and 3).

When the FWD Button is depressed, TR-107 emitter is grounded, and TR-107 passes R-104 and is turned on. TR-107 is maintained at "on" by RL-104 contact point Play-1.

The Pinch Roller Plunger and Brake Plunger current passes Play-3 and is turned on. The voltage passes Play 4 and is divided by means of R1A (350 Ω) and R2A (50 Ω). About 55 V is supplied to the Take-Up Motor and about 30 V to the Supply Motor. At 7-1/2 ips, 110 V is applied to the Main Motor and at 3-3/4 ips, 85 V is applied to the Main Motor.

At Forward Playback, TR-110 is turned on, and TR-111 is turned off. C-101 of T.D. Circuit passes R-101 and is charged.

5. 2-CHANNEL AUTOMATIC REVERSE PLAYBACK (See Figs. 1, 2 and 4)

a) From Forward to Reverse Playback.
   When the Reverse Button is depressed or when the sensing tape passes the sensing pole, TR-110 is turned off and TR-111 is turned on. Consequently, RL-105, RL-106, and RL-1 of Switch Board is turned on. When RL-106 is momentarily turned on, C-101 passes R-103 and VR-101 and discharge begins. C-101 discharge current flows to the base of TR-101 and TR-102 and they are turned on. When this occurs, RL-101 is turned on, and Brake Plunger as well as Pinch Roller Plunger is turned off. At this time, the capstan motor begins reverse revolutions. (While RL-101 is "on", because increased torque is applied to the capstan motor, high voltage is applied).
   When discharge of C-101 is completed, TR-101 and TR-102 are turned off. RL-101 is also turned off and voltage is supplied to the Pinch Roller Plunger as well as to the Brake Plunger and playback is effected.
b) From Reverse to Forward Play
   When the FWD Button is depressed or the sensing tape passes the sensing pole, TR-111 is turned off, and TR-110 is turned on. Because TR-111 is turned off, RL-105 and RL-106 as well as RL-1 are turned off. When RL-106 is momentarily turned off, CR-102 passes RL-103 and VR-101 and discharge commences. C-102 discharge current flows to the base of TR-101 and TR-102 and they are turned on. When this occurs, RL-101 is turned on and the Brake Plunger as well as the Pinch Roller Plunger are turned off. At this time, the capstan motor begins forward revolutions. (While RL-101 is "on", because increased torque is applied to the capstan motor, high voltage is applied).
   When discharge of C-102 is completed, TR-101 and TR-102 is also turned off and voltage is supplied to the Pinch Roller Plunger as well as to the Brake Plunger and Forward Playback is effected. Charge of C-101 is begun. (If Shut-Off Switch is at "on" position, this operation will not take place).

6. FAST FORWARD (See Figs. 1 and 2)

When the Fast Forward Button is depressed, current flows to RL-102 and RL-103. At the same time, TR-105 and TR-106 is maintained at "on", and Fast Forward operates. 100 V is applied to the Take-Up Motor and about 12 V to the Supply Motor.

When Fast Forward is effected from Forward Playback, DR-113 is activated and cuts off TR-107.

When Fast Forward is effected from Reverse Playback, D-114 is activated and cuts off TR-111.

When Fast Forward is effected from Rewind, TR-105 remains "on", TR-106 operates and RL-103 is turned on.

7. REWIND (See Figs. 1 and 2).

When the Rewind Button is depressed, TR-105 is turned on. TR-105 is maintained at "on" by means of RL-102. 100 V is applied to the Supply Motor and about 12 V to the Take-Up Motor.

When Rewind is effected from Forward Playback, D-112 is activated and cuts off TR-107.

When Rewind is effected from Reverse Playback, D-108 is activated and cuts off TR-111.

When Rewind is effected from Fast Forward, D-104 is activated and cuts off TR-106.

8. 4-CHANNEL REPEAT CIRCUIT (See Figs. 5 and 6)

When the Stereo Selector is set to 4-Channel position, Syscon Board A7 and A4 are opened. When during Forward Playback, the sensing tape passes the reverse sensing pole, TR-6 is turned off and TR-7 is turned on. At this time, TR-4 is "on" and TR-5 is turned off. Further, because TR-8 is "off" and TR-9 "on", B4 is grounded and at the same time, TR-107 is turned off. TR-105 is turned on and because it passes RL-102 is held at "on". Consequently, Rewind mode is attained and the tape begins to rewind.

When the sensing tape passes the Forward sensing pole, D_1 is grounded, TR-1 is turned on, TR-2 is turned off, and TR-3 is turned on. Thus, TR-4 which has been on up to now is turned off and TR-5 is turned from off to on. Because TR-5 is on, the unit operates in the same was as if the Forward Button had been depressed (TR-107 is turned on, and TR-105 is turned off. Consequently, Forward Play commences).

Because sensing tape is affixed at both ends, repeat mode is continuous (Play-Rewind-Play).

Rewind and Stop can be effected by depressing the Rewind Button during Repeat Mode. When the Rewind Button is depressed, TR-6 is turned on and TR-7 is turned off. For this reason, TR-4 is maintained at "on". Although Pin D_1 is grounded, and TR-1 is turned on, TR-2 off, and TR-3 on, because TR-4 is held at "on", and TR-5 is turned off, the machine will not enter Forward Play.

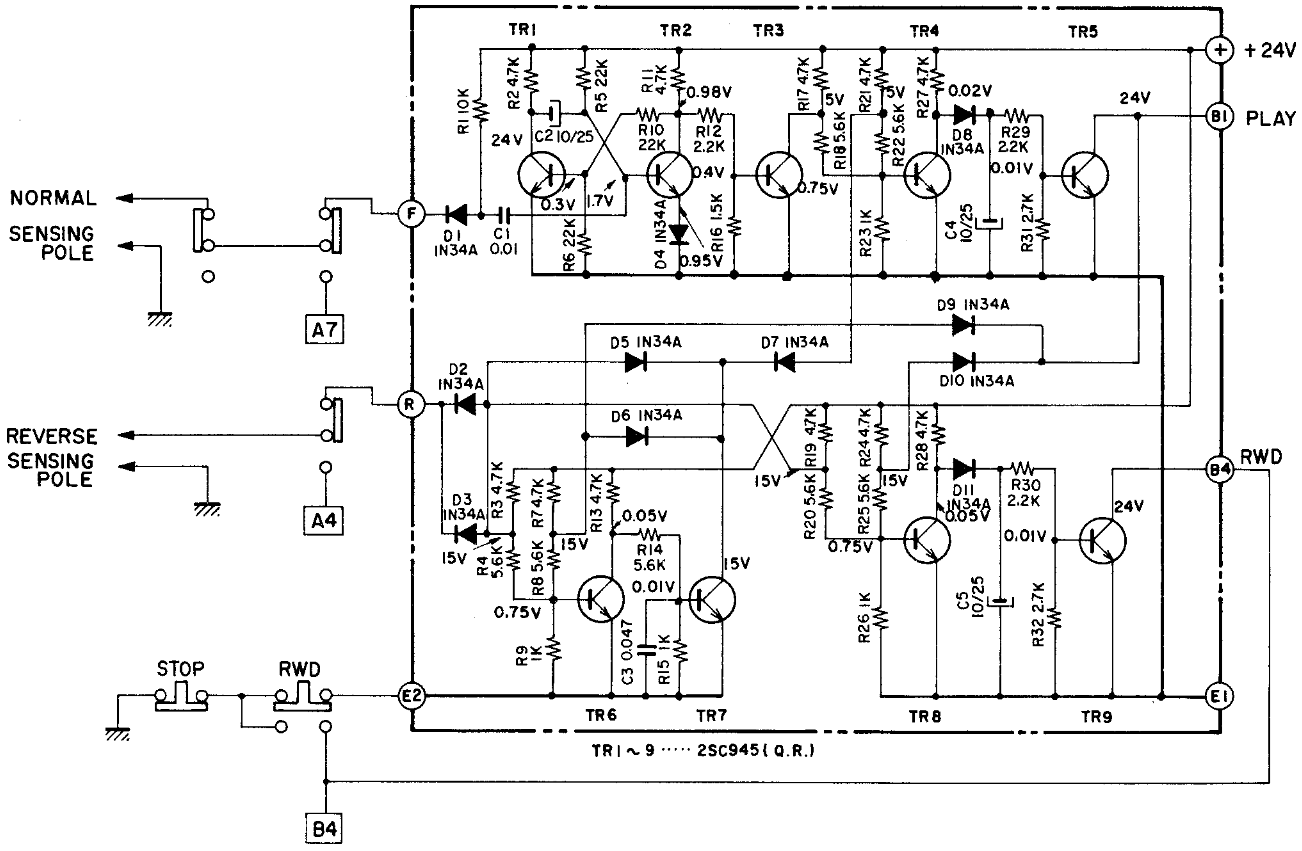
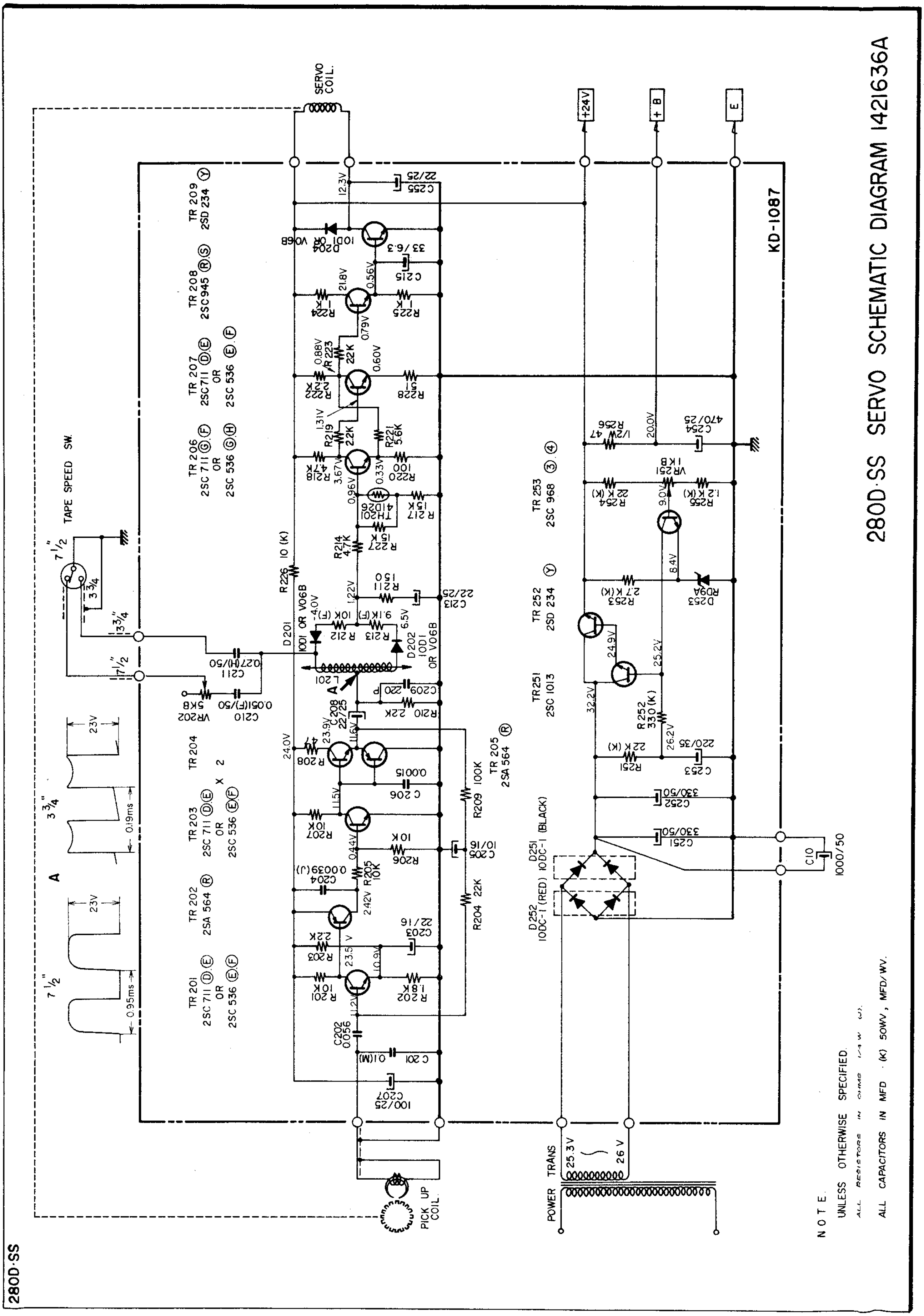

TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
+24V
PLAY
RWD
NORMAL
SENSING POLE
REVERSE
SENSING POLE
A7
A4
B4
STOP
RWD
F
R
E2
E1
B1
B4
D1 1N34A
C1 0.01
D2 1N34A
D3 1N34A
D4 1N34A
D5 1N34A
D6 1N34A
D7 1N34A
D8 1N34A
D9 1N34A
D10 1N34A
D11 1N34A
R1 10K
R2 4.7K
R5 22K
R11 4.7K
C2 10/25
R10 22K
R12 2.2K
R6 22K
R16 1.5K
R17 4.7K
R18 5.6K
R21 4.7K
R22 5.6K
R27 4.7K
R29 2.2K
R23 1K
C4 10/25
R31 2.7K
R3 4.7K
R4 5.6K
R7 4.7K
R8 5.6K
R9 1K
R13 4.7K
R14 5.6K
C3 0.047
R15 1K
R19 4.7K
R20 5.6K
R24 4.7K
R25 5.6K
R28 4.7K
R30 2.2K
R26 1K
C5 10/25
R32 2.7K
24V
0.98V
0.02V
5V
0.3V
1.7V
0.4V
0.75V
0.95V
0.01V
15V
0.05V
0.01V
0.75V
TR1 ∿ 9 ····· 2SC945 (Q.R.)

Fig. 5 4-CHANNEL REPEAT CIRCUIT

	TR105	TR107	TR1	TR2	TR3	TR4	TR5	TR6	TR7	TR8	TR9
Forward play	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF
Repeat (sensing tape passed Reverse sensing pole)	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	ON	OFF	ON
Stop the Forward play	OFF	ON	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
(sensing tape passed Forward sensing pole)	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	ON	ON	OFF

Fig. 6

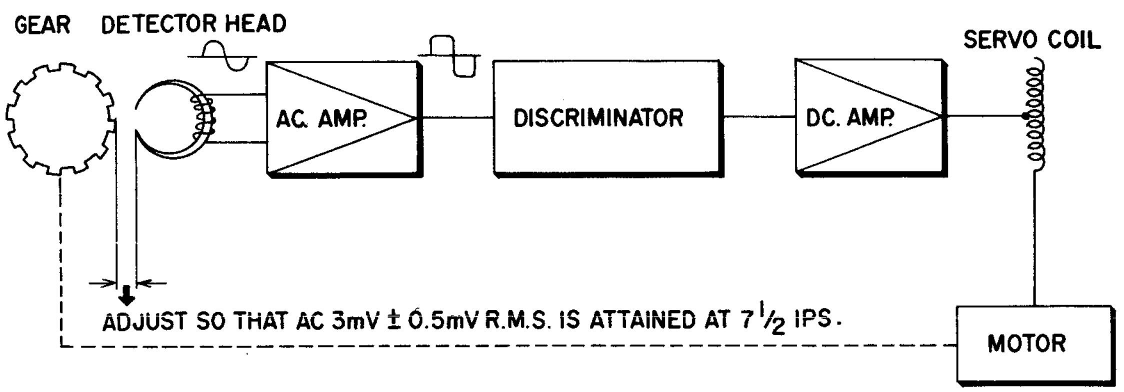
9. SERVO-MOTOR OPERATING PRINCIPLES


280D·SS
7 1/2"
A
3 3/4"
23V
23V
0.95ms
0.19ms
7 1/2"
3 3/4
TAPE SPEED SW.
7 1/2"
1 3/4"
TR 201
2SC 711 Ⓓ.Ⓔ
OR
2SC 536 ⒺⒻ
TR 202
2SA 564 Ⓡ
TR 203
2SC 711 ⒹⒺ
OR
2SC 536 ⒺⒻ
TR 204
X 2
VR202 5KB
C210 0.051(F)/50
C211 0.27(H)/50
TR 206
2SC 711 Ⓖ.Ⓕ
OR
2SC 536 Ⓖ.Ⓗ
TR 207
2SC711 ⒹⒺ
OR
2SC 536 Ⓔ.Ⓕ
TR 208
2SC945 ⓇⓈ
TR 209
2SD 234 Ⓨ
D201
10D1 OR V06B
R226 10 (K)
24.0V
C202 0.056
11.2V
23.5 V
10.9V
2.42V
R205 10K
0.44V
11.5V
23.9V
11.6V
C208 22/25
R201 10K
R203 2.2K
C204 0.0039(J)
R207 10K
R208 47
R202 1.8K
C203 22/16
R206 10K
C 206 0.0015
C 201 0.1(M)
100/25 C207
R210 2.2K
C209 220
P
L201
A
-4.0V
R 212 10K (F)
R 213 9.1K (F)
6.5V
D202 10D1 OR V06B
1.22V
R211 150
C213 22/25
R214 4.7K
R227 15K
TH201 41D26
R217 15K
0.96V
3.67V
0.33V
R218 4.7K
R219 2.2K
1.31V
R220 100
R221 5.6K
R222 2.2K
0.88V
R223 22K
0.60V
R228 51
R224 1K
21.8V
0.79V
0.56V
R225 1K
C215 33/6.3
D204 10D1 OR V06B
12.3V
C255 22/25
SERVO COIL.
PICK UP COIL.
R204 22K
C205 10/16
R209 100K
TR 205
2SA 564 Ⓡ
POWER TRANS
25.3V
26 V
D252
10DC-1 (RED)
D251
10DC-1 (BLACK)
TR251
2SC 1013
TR 252
2SD 234 Ⓨ
TR 253
2SC 968 ③.④
32.2V
24.9V
R251 22K (K)
R 252 330 (K)
25.2V
26.2V
C251 330/50
C252 330/50
C253 220/35
R253 2.7K (K)
D253 RD9A
8.4V
9.0V
R254 22K (K)
R255 1.2K (K)
VR251 1KB
R256 1/2W 47
20.0V
C254 470/25
+24V
+ B
E
KD-1087
C10 1000/50

NOTE.
UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS IN OHMS 1/4 W (J).
ALL CAPACITORS IN MFD · (K) 50WV, MFD/WV.

280D·SS SERVO SCHEMATIC DIAGRAM 1421636A

Fig. 7


GEAR
DETECTOR HEAD
AC. AMP.
DISCRIMINATOR
DC. AMP.
SERVO COIL
MOTOR

ADJUST SO THAT AC 3mV ± 0.5mV R.M.S. IS ATTAINED AT 7 1/2 IPS.

Fig. 8 Servo Circuit Block Diagram

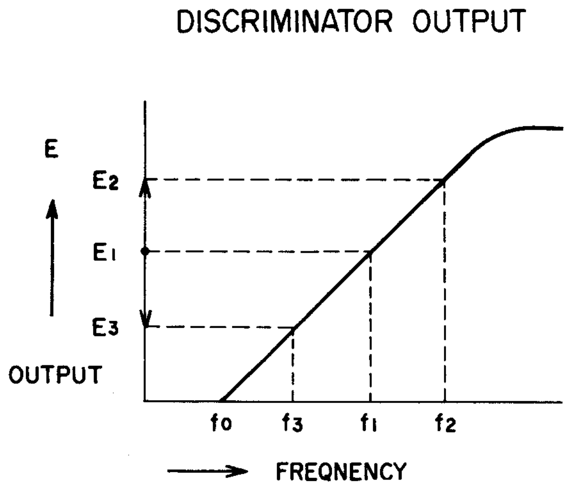

DISCRIMINATOR OUTPUT

Fig. 9

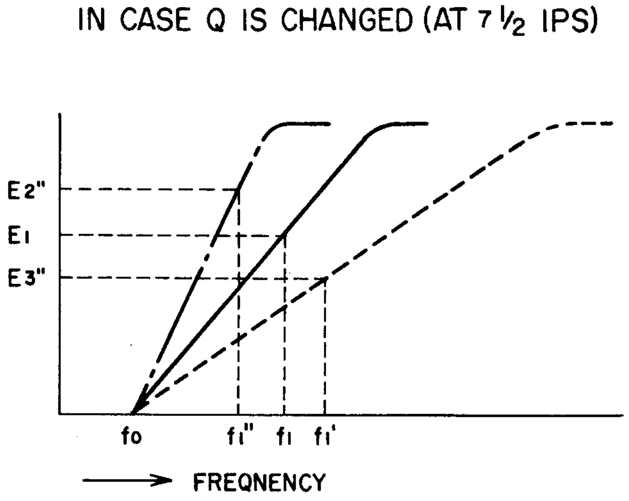

IN CASE Q IS CHANGED (AT 7 1/2 IPS)

Fig. 11

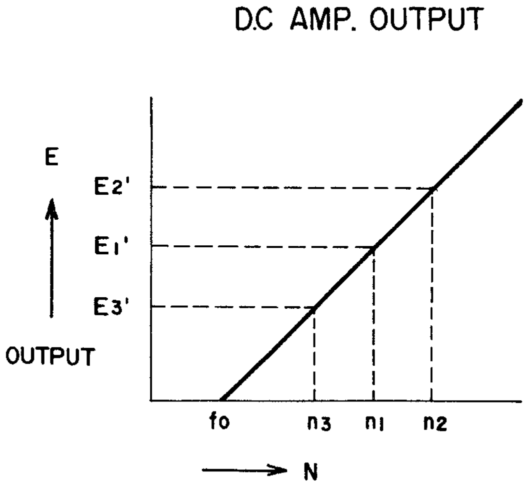

D.C AMP. OUTPUT

Fig. 10

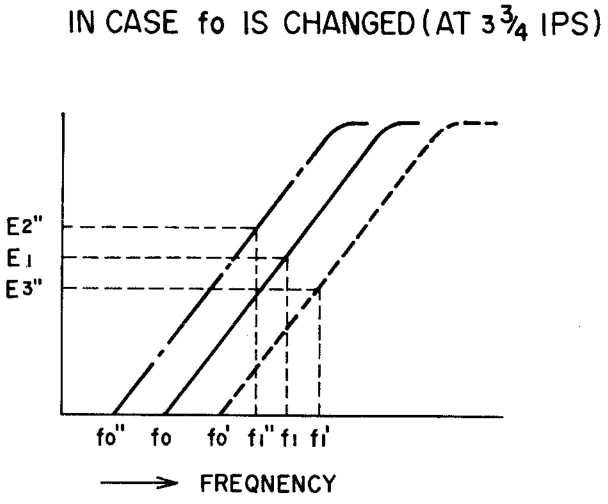

IN CASE fo IS CHANGED (AT 3 3/4 IPS)

Fig. 12

1) When the gap between the gear, which is directly connected from the capstan motor revolutions to the motor (120 gear teeth), and the pick-up coil changes, voltage is generated at the pick-up coil and from this frequency, the motor revolutions are detected. When proper revolutions are reached, this frequency is referred to as f_1.
2) This generated AC voltage (Vf_1) is amplified to saturation and supplied to the Discriminator.
3) The Discriminator is comprised of L-201 and C-210 (at 7-1/2 ips) (L201 and C-211 at 3-3/4) resonance circuit. This resonance frequency is referred to as f_0.

   (When the Speed Selector is switched, because the frequency of generated voltage at pick-up coil is changed, the various values of the Discriminator condensors are changed and f_0 is altered).
4) As shown in Fig. 9, the Discriminator emits an E_1 output which is the result of the f_1 frequency when motor revolutions are correct. This E_1 is amplified at DC Amp and is supplied to the Servo Coil. The motor revolutions at this time is referred to as n_1 and Brake Voltage E'_1 generates. The magnetic braking (produced by this E'_1) and load torque is balanced with motor torque and normal revolutions n_1 is maintained. (The main motor revolutions when no magnetic braking is applied is about 1460 r.p.m at 50 Hz, and about 1730 r.p.m at 60 Hz).
5) In case of certain influence resulting increased motor speed, the frequency detected by the pick-up coil becomes slightly high. At this time, the frequency is referred to as f_2. As shown in Fig. 9, the Discriminator output becomes larger than E_1 and E_2 output is emitted. As shown in Fig. 10, a DC Amp output of E_2' is obtained.

   Because E_2' is larger than E_1', a stronger than n_1 magnetic braking is applied for return to n_1 point.
6) If the motor speed is slow, the frequency detected by the pick-up coil is slightly low. At this time, the frequency is referred to as f_3. As shown in Fig. 9, the Discriminator output becomes smaller than E_1 and E_3 output is emitted. As shown in Fig. 10, a DC Amp output of E_3' is obtained. Because E_3' is smaller than E_1', the magnetic braking becomes weaker, and motor speed is increased for return to n_1 point. Thus, revolutions are stabilized and n_1 normal revolutions are maintained.
7) In order for n_1 to meet specified revolutions, it is necessary to adjust E_1. f_0 is changed by adjusting L-201 dust core (See Fig. 12), Q of resonance circuit is changed by adjusting VR-202, and as shown in Fig. 11, the rise-up angle of S curve is altered.

Because of this, E_1 and between E_2'' and E_3'' at center are delicately changed, and E_1 is fixed at normal specified revolutions.

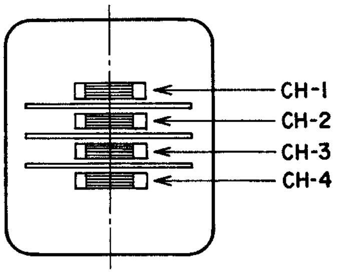
(Because, due to relationship to magnetic brake, motor self torque differs at 7-1/2 and 3-3/4 ips, the motor supply voltage changes).

	Motor Supply Voltage	Motor Voltage at beginning of Fwd or Rwd.	Pick-up coil Voltage	Pick-up coil Frequency	Motor Speed
7-1/2 ips	110 V	150 V	3 mV ±0.5 mV r.m.s.	About 1040 Hz	520 r.p.m.
3-3/4 ips	85 V	110 V	1.5 mV ±0.25 mV r.m.s.	About 520 Hz	260 r.p.m.

Fig. 13

10. 4-CHANNEL SURROUND STEREO SYSTEM

1). Head Construction


CH-1
CH-2
CH-3
CH-4

	(4-CH)	(2-CH)
CH-1	FRONT LEFT	FOWARD LEFT
CH-2	REAR LEFT	REVERSE RIGHT
CH-3	FRONT RIGHT	FOWARD RIGHT
CH-4	REAR RIGHT	REVERSE LEFT

PLAYBACK AND RECORDING HEAD

Fig. 14

2). ORDER OF HEADS

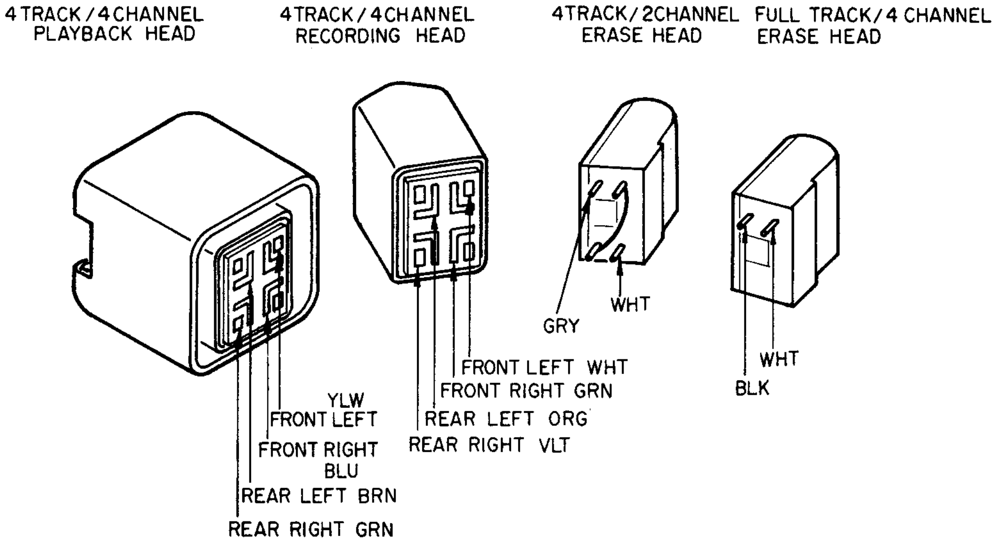
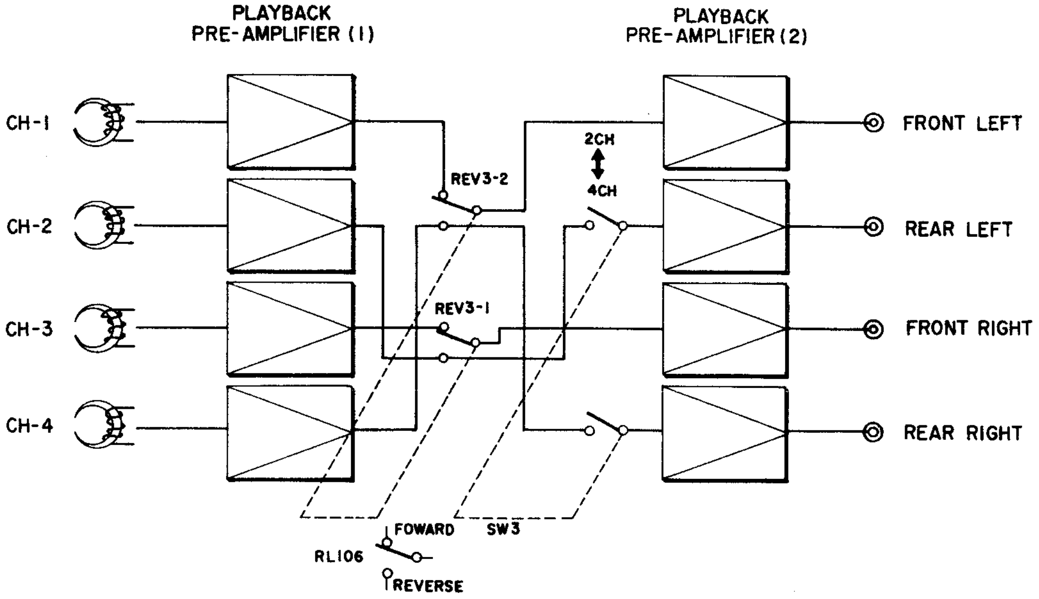

4TRACK/4CHANNEL PLAYBACK HEAD
4TRACK/4CHANNEL RECORDING HEAD
4TRACK/2CHANNEL ERASE HEAD
FULL TRACK/4 CHANNEL ERASE HEAD
YLW
FRONT LEFT
FRONT RIGHT BLU
REAR LEFT BRN
REAR RIGHT GRN
FRONT LEFT WHT
FRONT RIGHT GRN
REAR LEFT ORG
REAR RIGHT VLT
GRY
WHT
WHT
BLK

Fig. 15

3). Block Diagram when switched from 2-CH to 4-CH and 2-Channel Reverse Playback


PLAYBACK PRE-AMPLIFIER (1)
PLAYBACK PRE-AMPLIFIER (2)
CH-1
CH-2
CH-3
CH-4
REV3-2
REV3-1
2CH
4CH
FRONT LEFT
REAR LEFT
FRONT RIGHT
REAR RIGHT
FOWARD
SW3
RL106
REVERSE

NOTE : PLAYBACK PRE-AMPLIFIER (1) AND (2) IS SAME P.C. BOARD. (MS-5022)

Fig. 16

V. MECHANISM ADJUSTMENT

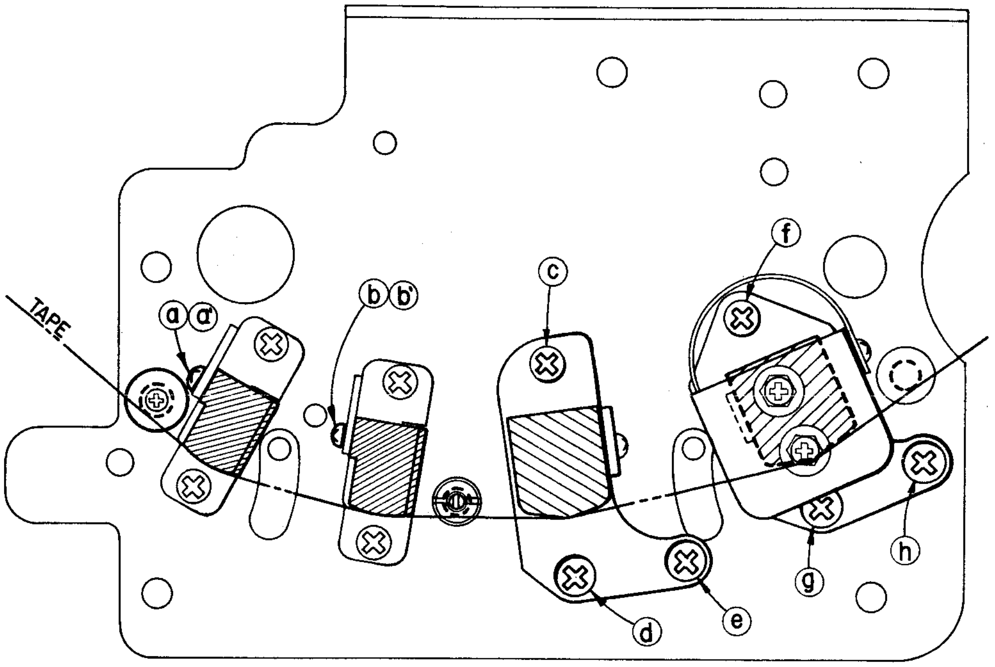


Fig. 17

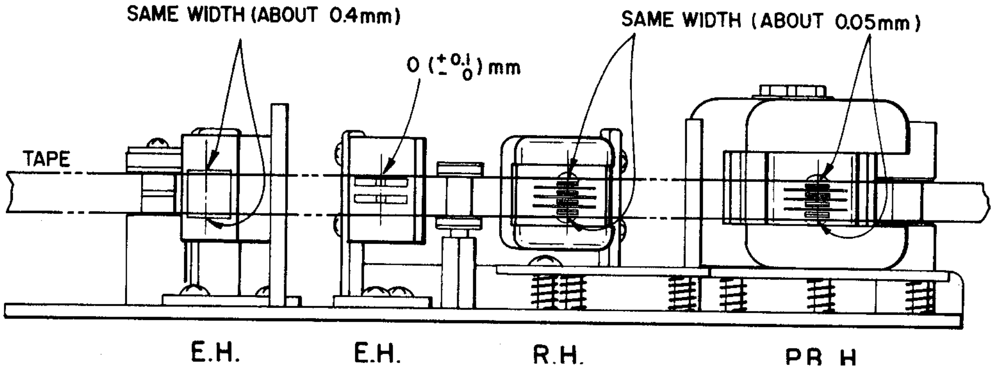


Fig. 18

1. ADJUSTMENT OF HEAD ALIGNMENT

A. Adjustment of Head Height (See Figs. 17 and 18)

a) Erase Head (4-channel)
Loosen Full Track Erase Head Adjustment Screws (a) (a') and adjust so that the width of the head core on both sides of the tape are equal. (Core should protrude about 0.4 mm at both top and bottom).

b) Erase Head (2-channel)
Loosen 2-Track Erase Head Height Adjustment Screws (b) (b') and adjust so that the upper edge of the head core and the upper edge of tape are the same height (0 (+0.1/−0) mm).

c) Recording Head
With Height Control Screws (c) (d), adjust so that the width between the upper edge of Track 1 head core and the upper edge of the tape is equal to the width between the lower edge of track 4 head core and the lower edge of the tape (about 0.05 mm).

d) Playback Head
With Height Control Screws (f) (g), adjust so that the width between the upper edge of the tape is equal to the width between the lower edge of Track 1 head core and the upper edge of Track 4 head core and the lower edge of the tape (about 0.05 mm).

B. Adjustment of Head Slant (See Figs. 17 and 18)

Adjust Screws (c) (d) and (f) (g) so that the tape makes perfect contact with the various heads (recording and playback heads).
If Head Slant Adjustment causes a shift in head height positions, readjust head height.

C. Adjustment of Head Azimuth (See Figs. 17 and 18)

a) Playback Head
Play back a pre-recorded tape (8,000 Hz) at 3-3/4 ips and connect a High Sensitivity V.T.V.M. to the line output. Then, turn Azimuth Control Screw (h) until the output level of both channels reaches maximum.

b) Recording Head
At recording mode, supply a 8,000 Hz. sinewave at a −10 dB recording level from an Audio Frequency Oscillator to the line input and set the Monitor Switch to "Tape" position. Connect a High Sensitivity V.T.V.M. to the line output. Then, turn Azimuth Control Screw (e) until the output of both channels reaches maximum.

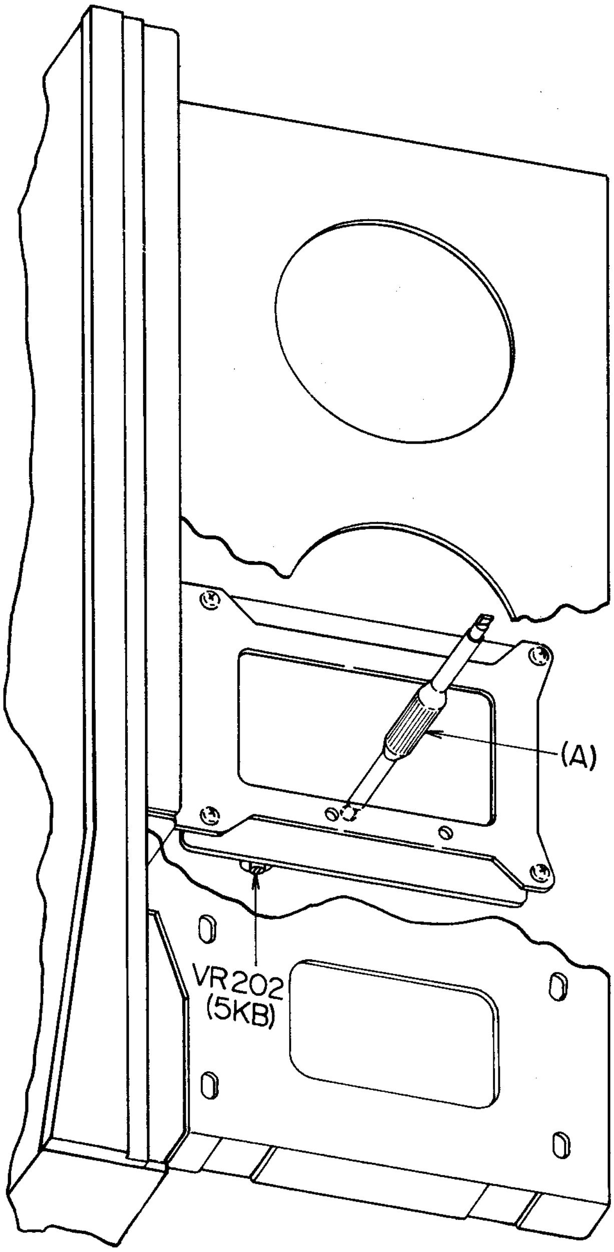


Fig. 19

2. TAPE SPEED ADJUSTMENT METHODS (See Fig. 19) (Servo-Motor Circuit Adjustment)

Measuring Method Involving Use Of Pre-recorded Tape

a) Set Tape Speed Selector to 3-3/4 ips and playback a 1 KHz pre-recorded tape.
b) Connect a Frequency Counter to the line output.
c) Adjust L-201 in transformer core so that the Frequency Counter indication is 500 Hz (±1%).
d) Set Tape Speed Selector to 7-1/2 ips.

Adjust VR-202 (5 KB) so that the Frequency Counter indication is 1,000 Hz. (+1.0/−0.5%)

Motor revolutions at each speed should be as follows :

7-1/2 ips 520 r.p.m.
3-3/4 ips 260 r.p.m.

In case a Frequency Counter is not available, connect an oscilloscope to the center point of L201 and measure the respective waveforms (Refer to Servo Motor Operating Principles Fig. 7).

3. ADJUSTMENT OF FORWARD ↔ REVERSE TIME CONSTANT (See Fig. 20)

The Time Constant when switching to and from Forward and Reverse Play is adjusted with System Control Board VR-101 (30 KB). About 3 seconds is ideal.

4. ADJUSTMENT OF FAST FORWARD OR REWIND TO FORWARD OR REVERSE PLAYBACK (See Fig. 20)

The various Time Constants when switching from Fast Forward or Rewind to Forward or Reverse Play are adjusted with System Control Board VR-102 (10 KB). About 1.5 seconds is ideal.

During Fast Forward or Rewind operation, Relay Contact Point "Fast 1" charges C-103. When Fast 1 is turned off, C-103 discharge turns on TR-103 and TR-104 and RL-101 (T.D.) is activated. When C-103 is completely discharged, RL-101 is turned off.

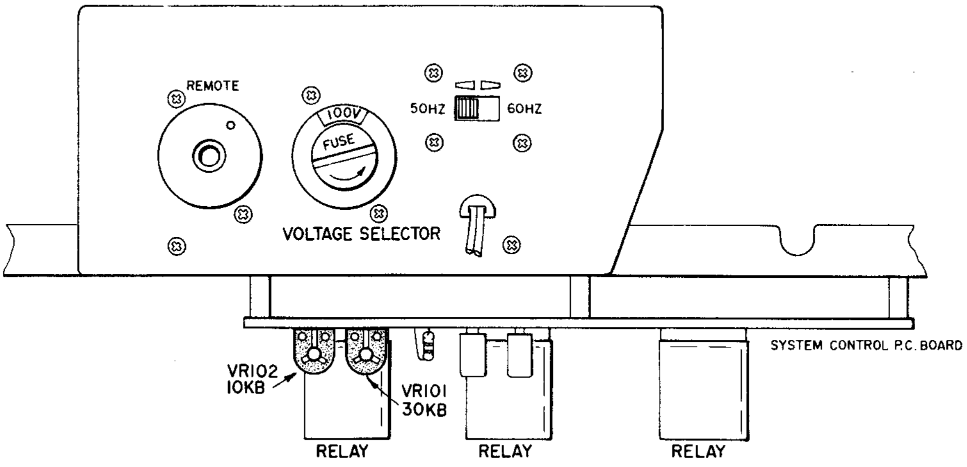


Fig. 20

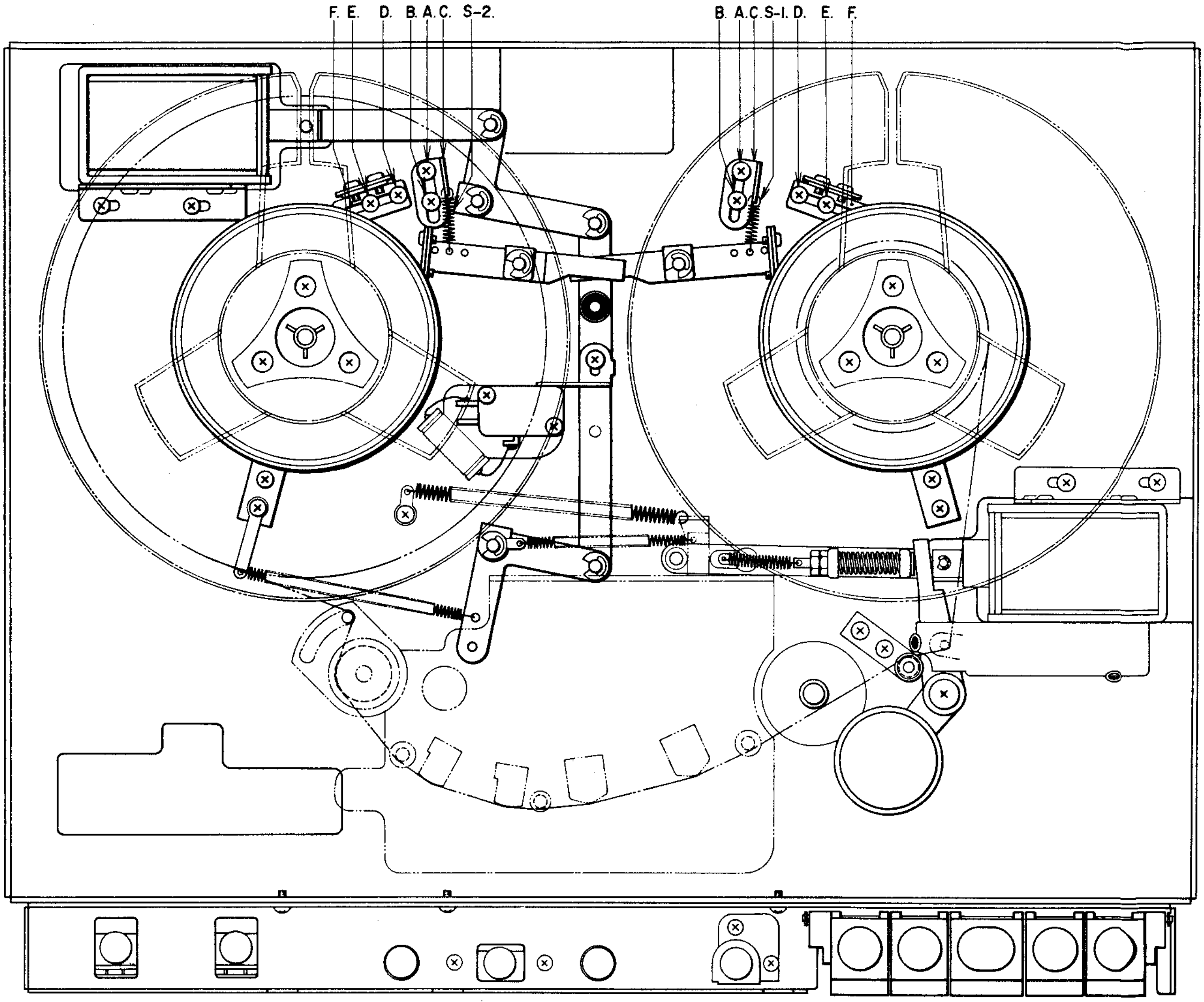


Fig. 21

5. BRAKE TENSION ADJUSTMENT (See Fig. 21)

For Brake Tension Measurement, use a 60 mm tape wound on a 5″ reel and measure with a Tension Gauge. Standard tension is about 350 grams. Adjust Brake Tension by changing position of suspended springs (S 1 and S 2 in Fig. 22), loosening screws (A) and (B) and changing position of spring suspension metal (C), or loosening screws (D) (E) and changing position of F.

Caution : Following Brake Adjustment, confirm that the Brake Band does not touch the cloth tape on brake drum (See Fig. 22).

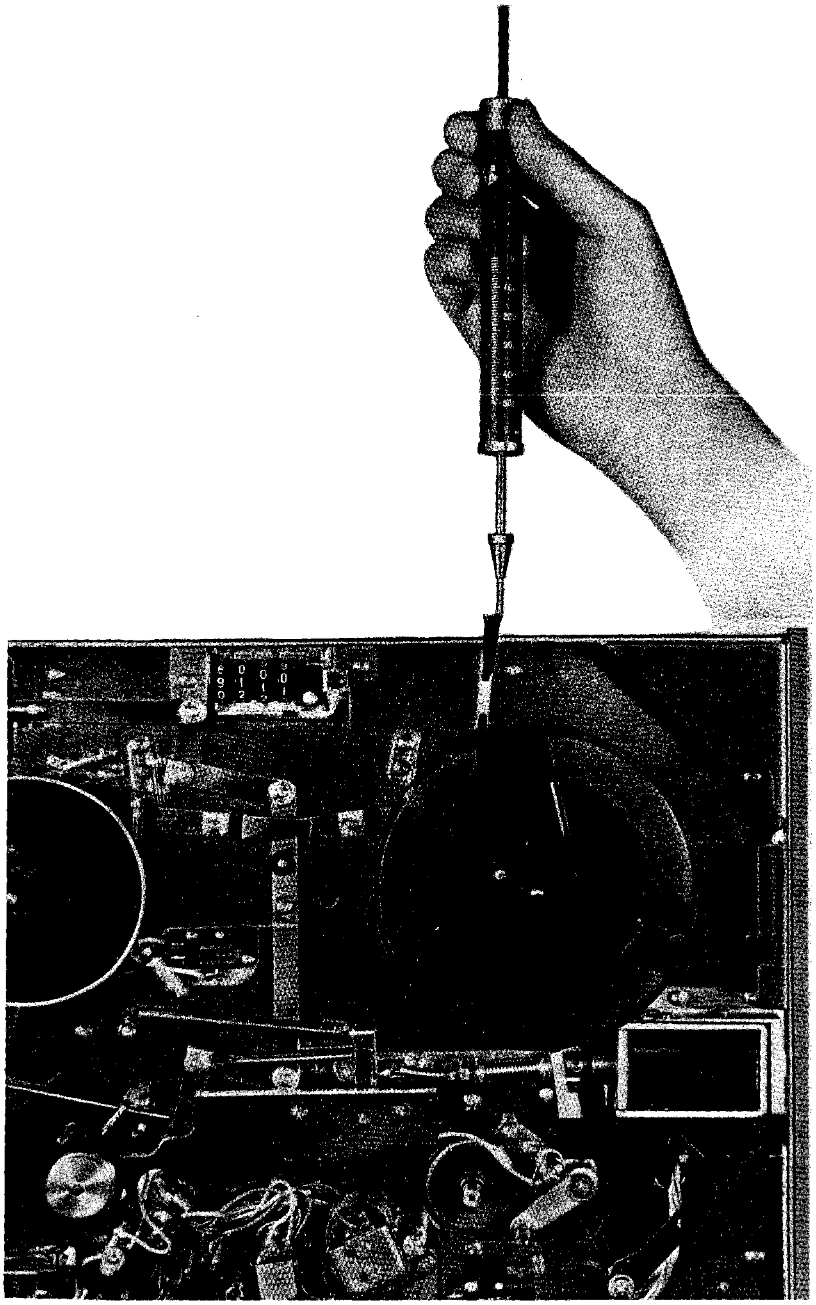


Fig. 22

6. REEL HEIGHT ADJUSTMENT (See Diagram Illustration)

Loosen Reel Table Adjusting Screws and regulate height.

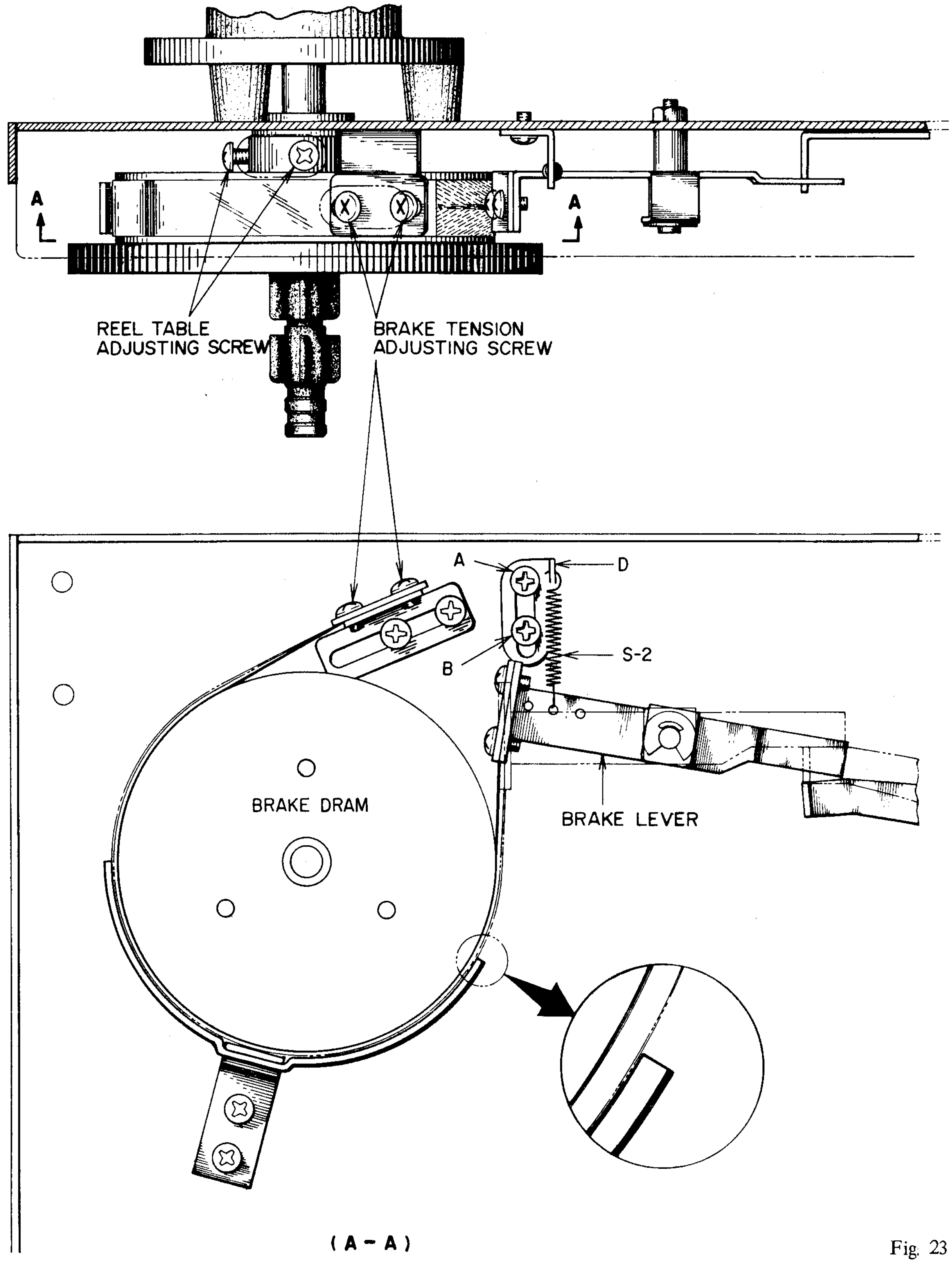

A
A
REEL TABLE ADJUSTING SCREW
BRAKE TENSION ADJUSTING SCREW
A
D
S-2
B
BRAKE DRAM
BRAKE LEVER
(A - A)

Fig. 23

VI. AMPLIFIER ADJUSTMENT

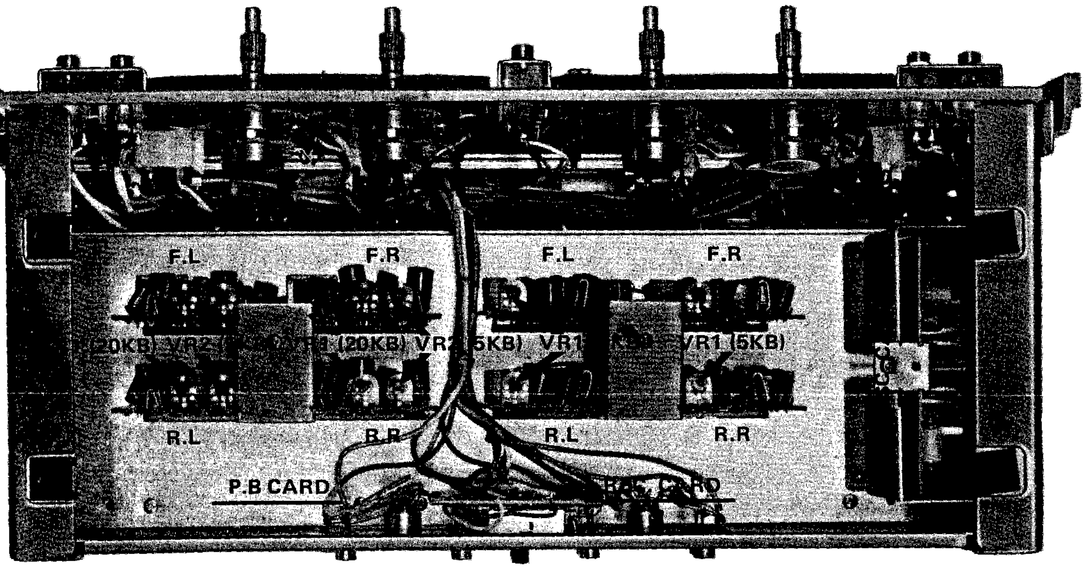

F.L
F.R
F.L
F.R
(20KB) VR2
VR1
(20KB) VR2
(5KB) VR1
VR1 (5KB)
R.L
R.R
R.L
R.R
P.B CARD
REC CARD

Fig. 24

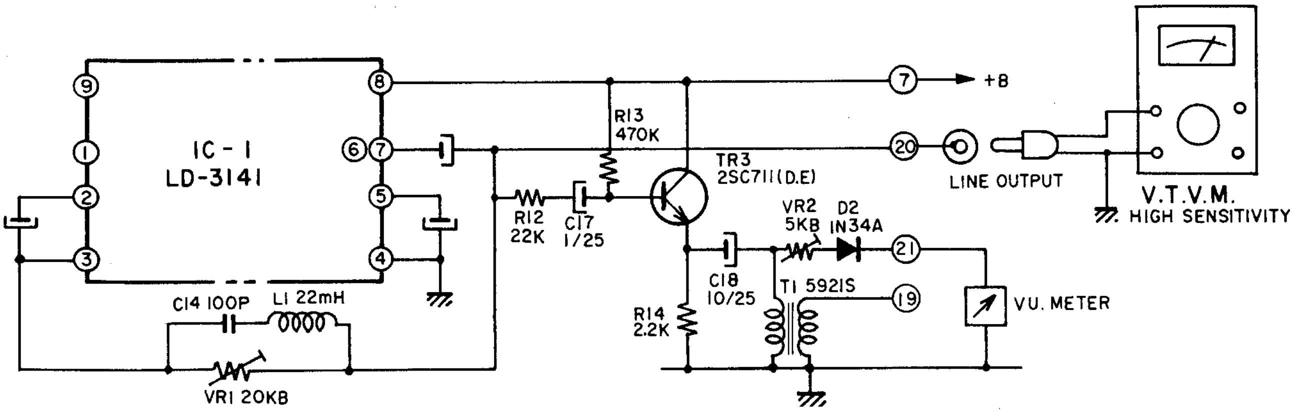

IC - 1
LD-3141
9
1
2
3
8
6
7
5
4
C14 100P
L1 22mH
VR1 20KB
R13
470K
R12
22K
C17
1/25
TR3
2SC711(D.E)
C18
10/25
R14
2.2K
VR2
5KB
D2
IN34A
T1 5921S
7
+B
20
LINE OUTPUT
21
19
VU. METER
V.T.V.M.
HIGH SENSITIVITY

Fig. 25

1. ADJUSTMENT OF LINE OUTPUT LEVEL

A. Playback (See Figs. 24 and 25).

a) Connect a high sensitivity V.T.V.M. to the Line Output Jack.

b) Set the Tape Speed Selector Switch to "7-1/2" position.

c) Set the Channel Selector to "4-CH" position.

d) Play back a 250 Hz. pre-recorded tape.

e) Adjust VR-1 (semi-fixed resistor 20 KB, Fig. 24) of playback amplifier so that the line output voltage is 1.228 V (+4 dB ±1.5 dB).

f) Adjust VR-2 (semi-fixed resistor 5 KB, Fig. 24) of playback amplifier so that the VU Meter indicates "0" VU.

B. Recording and Playback (See Figs. 24 and 26)

a) As shown in Fig. 26, connect an Audio Oscillator to the Line Input. Connect a high sensitivity V.T.V.M. to the Line Output.

b) Set Tape Speed Selector to "7-1/2" position.

c) Load a blank test tape "AKAI 100L" (FUJI S-100) on the tape recorder and set Monitor Switch to "Source" position.

d) Feed in a 1,000 Hz. sine wave signal from an Audio Frequency Oscillator to the Line Input of the 280D-SS and turn Recording Line Level Control VR1 (50 KA) until the line output level reaches "0" VU (+4 dB).

e) Depress "REC" Button and set machine to recording mode (run tape).

f) Set Monitor Switch to "Tape" position and turn Recording Line Level Control VR1 (50 KA) again until the line output level reaches "0" VU.

g) Set Monitor Switch to "Source" position again and turn Volume Control VR-1 (5 KB) until the line output level reaches "0" VU.

h) Repeat twice in the same way as indicated in items f) and g) above.

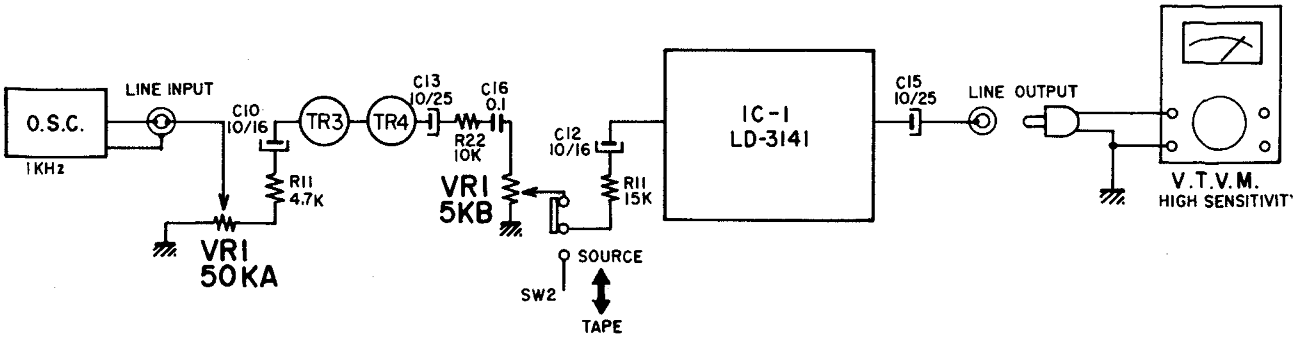

O.S.C.
1KHz
LINE INPUT
C10 10/16
R11 4.7K
VR1 50KA
TR3
TR4
C13 10/25
C16 0.1
R22 10K
VR1 5KB
C12 10/16
R11 15K
SOURCE
SW2
TAPE
IC-1 LD-3141
C15 10/25
LINE OUTPUT
V.T.V.M.
HIGH SENSITIVIT'

Fig. 26

2. RECORDING BIAS FREQUENCY ADJUSTMENT (See Figs. 27 and 28).

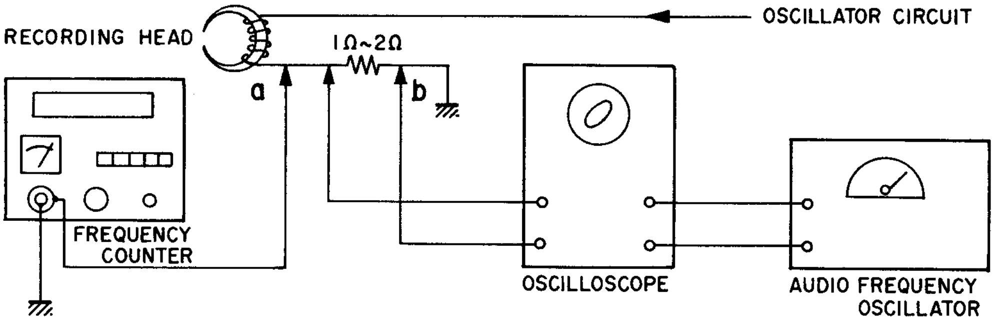

RECORDING HEAD
OSCILLATOR CIRCUIT
1Ω~2Ω
a
b
FREQUENCY COUNTER
OSCILLOSCOPE
AUDIO FREQUENCY OSCILLATOR

Fig. 27

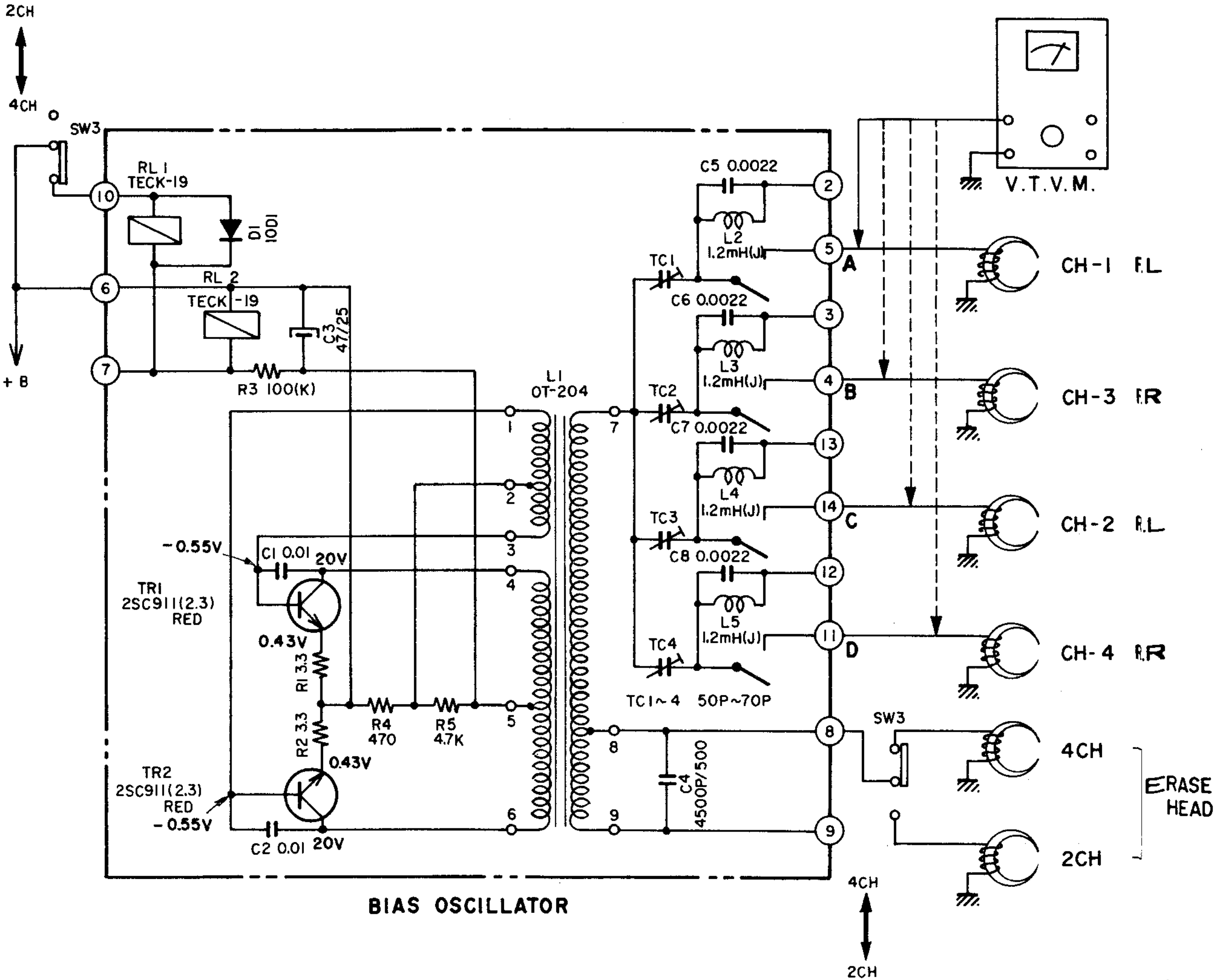

2CH
4CH
SW3
RL 1 TECK-19
D1 10D1
RL 2 TECK-19
C3 47/25
R3 100(K)
+B
L1 OT-204
-0.55V
C1 0.01
20V
TR1 2SC911(2.3) RED
0.43V
R1 3.3
R2 3.3
R4 470
R5 4.7K
0.43V
TR2 2SC911(2.3) RED
-0.55V
C2 0.01
20V
C5 0.0022
L2 1.2mH(J)
TC1
C6 0.0022
L3 1.2mH(J)
TC2
C7 0.0022
L4 1.2mH(J)
TC3
C8 0.0022
L5 1.2mH(J)
TC4
TC1~4 50P~70P
C4 4500P/500
A
B
C
D
V.T.V.M.
CH-1 F.L
CH-3 F.R
CH-2 R.L
CH-4 R.R
4CH
2CH
ERASE HEAD
BIAS OSCILLATOR

Fig. 28

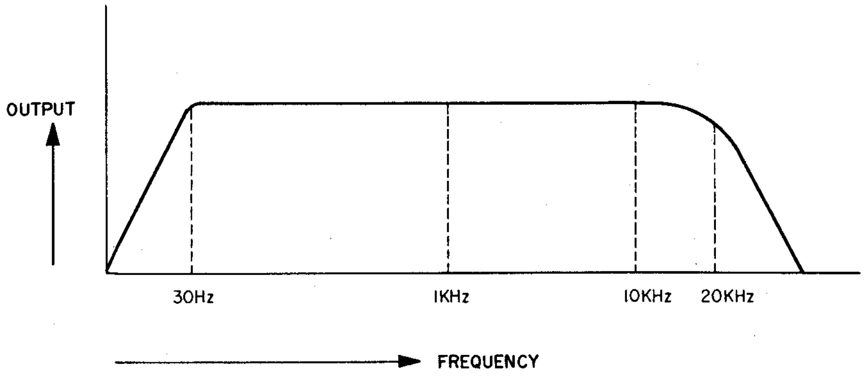


Fig. 29

Part I

a) Install a resistor of 1 or 2 ohms in series with the Recording Head and connect the Vertical Input Terminal of the Oscilloscope to points (a) and (b).

b) Feed in a sine wave signal from an Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the dial of the Audio Frequency Oscillator until the Oscilloscope displays a circular or linear pattern.

c) A reading of 100 KHz to 110 KHz (4-channel operation) indicates that the Recording Bias Frequency is correct.

d) For correction of the Recording Bias Frequency, adjust the value of C-4 (4500 p).

Part II

a) If a Frequency Counter is available, connect Frequency Counter Output Lead between (a) and (b) in Fig. 4 and read indication.

3. RECORDING BIAS VOLTAGE ADJUSTMENT

(FREQUENCY RESPONSE ADJUATMENT,)
(See Figs. 28 and 29)

a) Follow the Frequency Response Measuring Method.

b) Supply a 1 KHz Input from an Audio Oscillator and adjust to "0" VU.

c) Lower VU Level from 0 dB to −16 dB by means of an Attenuator.

e) Connect a high sensitivity V.T.V.M. to the Line Output.

f) Play back the 1 KHz and 10 KHz recorded signals and adjust Bias Voltage Adjusting Variable Capacitors TC-1 to TC-4 so that the output of both signals are equal.
Bias Voltage is about 13 to 18 volts. Proper frequency response at 3-3/4 ips and 7-1/2 ips is dependent upon these adjustments. (Frequency response will vary according to type of tape used).

Note : There is no way of adjusting the Erasing Bias Voltage, but correct voltage is between AC 65 and 75 volts.

VII. TROUBLE SHOOTING CHART

SECTION "A" TROUBLE WITH TRANSPORT MECHANISM

SYMPTOM	REMARKS
No power even when power switch is turned on.	1. Check position of Auto Shut-Off Switch. 2. Fuse disconnected.
Capstan rotates during playback mode, but there are no reel motor revolutions.	1. Faulty F.F. or FAST Relay contact point. 2. R1A (350 Ω) or R2A (60 Ω) disconnected. 3. Torque motor itself defective.
Faulty reverse operation (does not reverse from forward mode)	1. Check reverse sensing pole. 2. Check TR-110 (2SC968) and TR-111 (2SC968) 3. Check Relay RL-105 and RL-106. 4. D-121 defective.
(does not forward from reverse mode)	1. Check reverse sensing pole 2. Check TR-110 and TR-107. 3. Check Relay RL-104.
Does not Rewind	1. Rewind operation switch (SW-14) defective. 2. Supply reel motor defective. 3. Check AC voltage. 4. Relay RL-102 (FAST) defective. 5. Check TR-105 (2SC945). 6. Accumulation of dust particles on tape surface.
Does not Fast Forward	1. F.Fwd operation switch (SW-15) defective. 2. Take-up reel motor defective. 3. Check AC power voltage. 4. Relay RL-102 (FAST) and RL-103 (F.F) defective 5. Check TR-106 (2SC945)
Faulty Brake Operation	1. Brake solenoid defective. 2. Faulty contact point Relay RL-104 (play) or RL-102 (FAST). 3. D-123 (10 D4) defective. 4. Brake band adjustment faulty.
Wow/Flutter	1. Check to see whether brake shoe is touching reel table. 2. Check Pinch Roller Pressure. 3. Excessive torque motor vibration. 4. Main motor revolutions faulty.
Faulty Repeat operation (does not reverse direction when sensing tape passes sensing pole) 4-channel only	1. Faulty contact of sensing tape and sensing pole. 2. Check repeat circuit transistor TR-8 and TR-9. 3. Check repeat circuit Diode D2 and D11.
During Repeat Mode, when tape is rewound, it stops and does not enter forward play.	1. Faulty contact of sensing tape and sensing pole. 2. Check repeat circuit Diodes D1, D7, and D8. 3. Check repeat circuit transistors TR-1 to TR-5 and TR-7. 4. Rewind Button (Micro SW) faulty contact.
Squeaking noise when playing tape	1. Deposit of dust on heads. 2. Recording tape is being charged with static electricity. 3. Head surface excessively heated after continued operation. 4. Worn out tape 5. Inferior quality tape.

SECTION "B" TROUBLE WITH MAIN (SERVO) MOTOR

SYMPTOM	REMARKS
Incorrect motor revolutions	1. Tape speed adjustment faulty. (See adjustment procedure). 2. Motor coil defective 3. Motor condenser defective 4. Check B+ (24 V) Voltage
(Discriminator L-201 center point waveform normal) (See Servo-Motor operating principle, Fig. 7)	2. Check voltage of DC Amp (TR-206 to TR-209) 2. Check D-201 and D-202. 3. Check Servo Coil.
(Discriminator L-201 center point waveform abnormal)	1. Check voltage of AC Amp (TR-201 to TR-205) 2. Pick-up coil defective. 3. L-201 defective 4. Faulty adjustment of gap between motor gear and pick-up coil (Refer to Servo Motor Operating Principle).

SECTION "C" TROUBLE WITH AMPLIFIER

1. PLAYBACK MODE

SYMPTOM	REMARKS
No sound from Line Output Jack (No B+ voltage supply)	1. Check Diodes D-251 and D-252. 2. Check Transistors TR-251 to TR-253
(B+ voltage supply)	1. Check voltage of playback card (MS-5022). 2. Check working order of trnasistors TR-1, TR-2 and TR-3 and IC-1 (LD-3141) on MC-5022. 3. Playback Head defective.
Will play, but volume insufficient (B+ voltage low)	1. Check voltage of power supply circuit (KD-1087)
(B+ voltage normal)	1. Oxide deposits accumulated on head. Clean head. 2. Playback head defective.
Humming Noise (when playback head is grounded noise decreases)	1. Playback head defective.
(grounding playback head does not alter hum)	1. Check transistor TR-253 on KD-1087. 2. Check condensors C-251 to C-254 and C-10.
Sound Distorted	1. Oxide accumulated on playback head. 2. Check B+ voltage. 3. Check voltage of playback card (MS-5022) 4. Playback head worn out.
Hissing Noise	1. Check TR-1, TR-2, and IC-1 (LD-3141) on playback card (MS-5022) 2. Head magnetized. 3. Defective Playback Coil.
Sound drop-out	1. Tape old or defective. 2. Component connections poor contact.

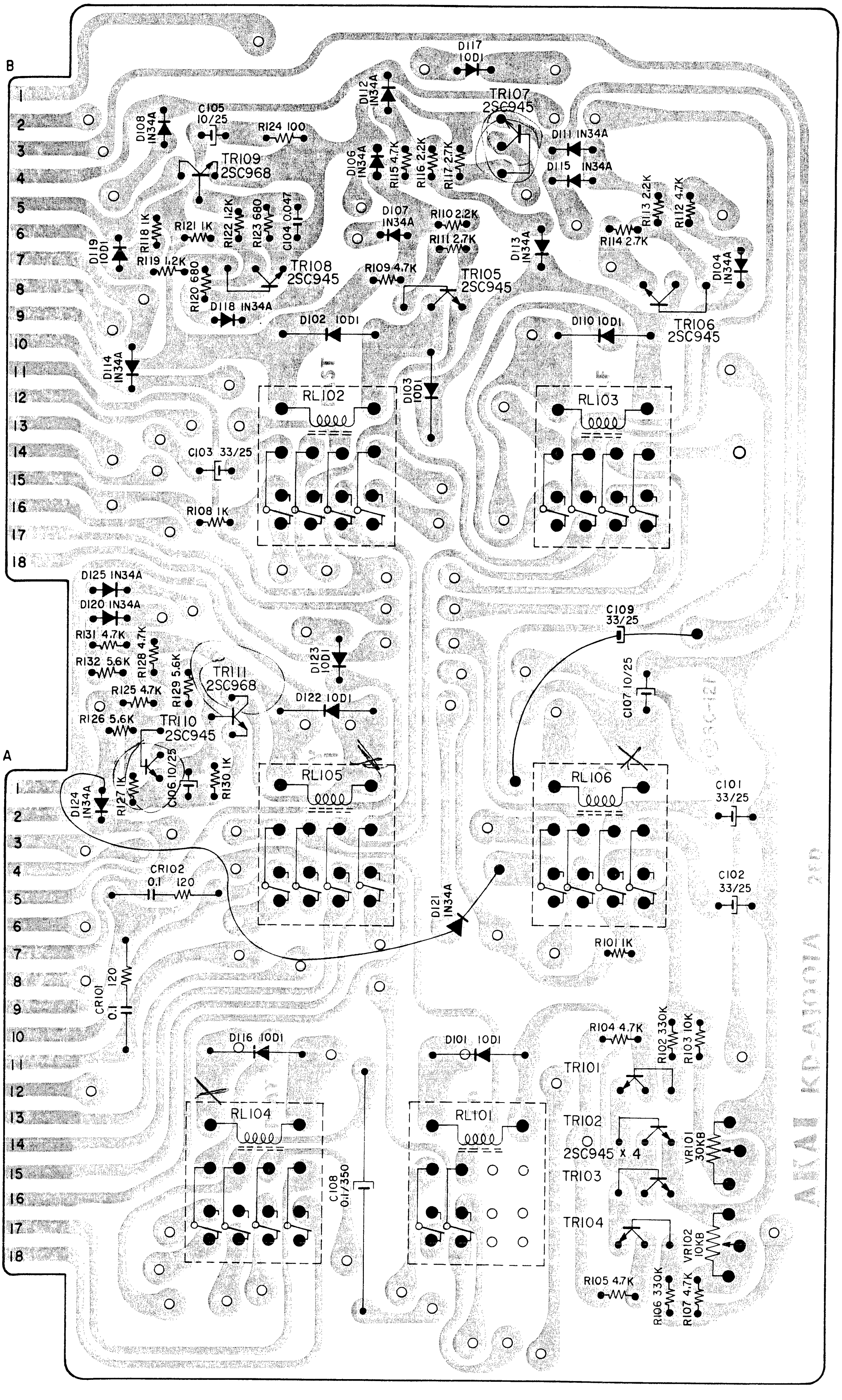
SYMPTOM	REMARKS
Irregular Scratching or Crackling noise	1. Check transistors TR-1 and TR-2 and IC-1 (LD-3141) on playback card (MS-5022)
Lack of Treble	1. Oxide deposits collected on playback head surface. 2. Discrepancy in playback head azimuth alignment. 3. Head worn out.
Considerable difference between left and right (front or rear) levels during playback	1. Playback level out of adjustment

2. RECORDING MODE

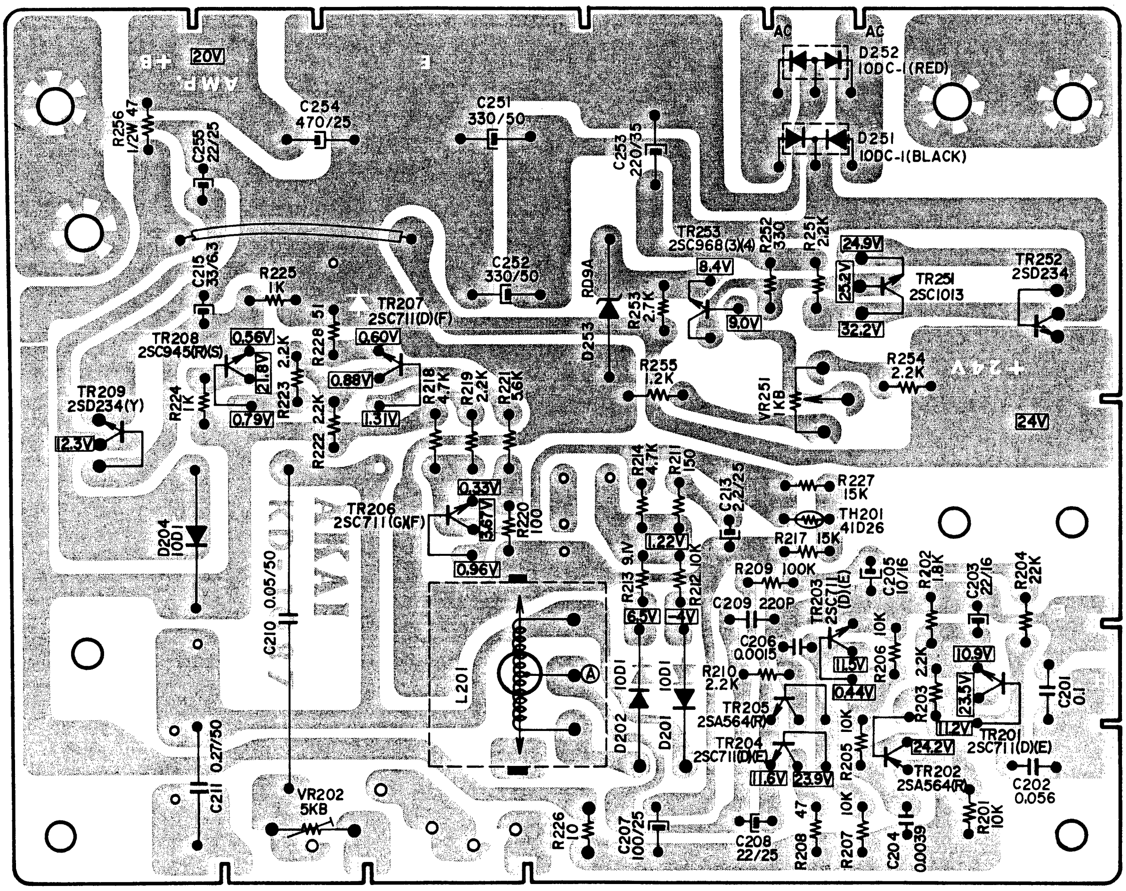
SYMPTOM	REMARKS
Does not record (4-channel or 2-channel) (No VU Meter indication)	1. VU Meter itself or lead wire defective. 2. Defective input jack. 3. Check voltage of recording card (MS-5023)
(VU indication normal)	1. Check transistors TR-108 and TR-109 on system control. 2. Check Relay RL-1 and RL-2 on oscillator circuit (KF-5010) 3. Components of oscillator circuit or oscillator coil defective. 4. Recording head defective.
Sound Distorted (VU Meter functions normally. Also functions normally when monitor switch is at "source" position.	1. Faulty recording bias voltage. 2. Defective recording equalization circuit. 3. Dirty head.
Faulty erasing (4-channel or 2-channel) (Does not erase at all)	1. Erase head defective. 2. Disconnected erase head wire. 3. Components of oscillator circuit or oscillator coil defective.
(Incomplete erasure)	1. Erasing bias voltage low (check oscillator circuit) 2. Erase head defective.
Erasing Noise (popping noise)	1. Defective recording. 2. Transistor TR-1 or TR-2 or KF-5010 defective. 3. Head magnetized.
Recording sensitivity low (UV Meter functions normally)	1. Dirty head 2. Bias voltage out of adjustment 3. Tape itself defective.
(VU meter does not indicate properly)	1. Loose input jack connection 2. VU Meter sensitivity low. 3. Recording level out of adjustment.
Considerable difference between left and right (front or rear) levels when recording	1. Recording level out of adjustment.

VIII. COMPOSITE VIEWS OF COMPONENTS

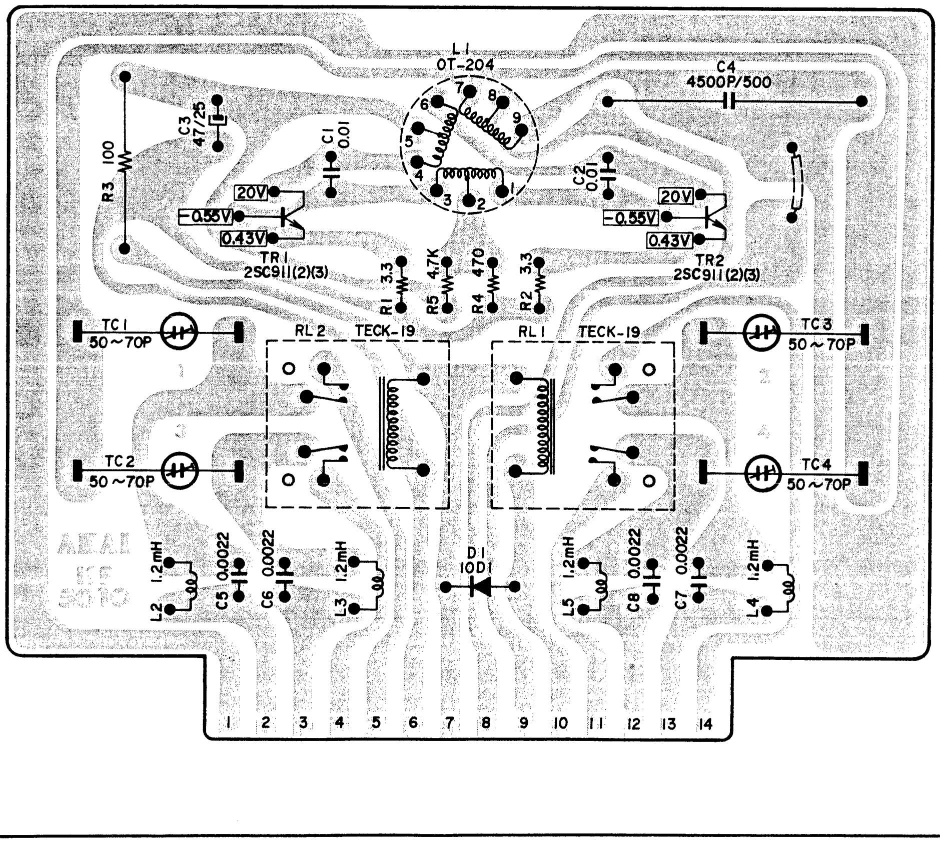
SYSTEM CONTROL P.C. BOARD (KDA-1001A)


B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
D117 10D1
D112 IN34A
TR107 2SC945
D111 IN34A
D115 IN34A
D108 IN34A
C105 10/25
R124 100
TR109 2SC968
D106 IN34A
R115 4.7K
R116 2.2K
R117 2.7K
R113 2.2K
R112 4.7K
R114 2.7K
R118 1K
R121 1K
R122 1.2K
R123 680
C104 0.047
D107 IN34A
R110 2.2K
R111 2.7K
D113 IN34A
D119 10D1
R119 1.2K
R120 680
TR108 2SC945
R109 4.7K
TR105 2SC945
D104 IN34A
D118 IN34A
D102 10D1
D110 10D1
TR106 2SC945
D114 IN34A
D103 10D1
RL102
RL103
C103 33/25
R108 1K
D125 IN34A
D120 IN34A
R131 4.7K
R128 4.7K
R132 5.6K
R129 5.6K
TR111 2SC968
R125 4.7K
D123 10D1
D122 10D1
R126 5.6K
TR110 2SC945
C109 33/25
C107 10/25
R127 1K
C106 10/25
R130 1K
D124 IN34A
RL105
RL106
C101 33/25
C102 33/25
CR102 0.1 120
D121 IN34A
R101 1K
CR101 120 0.1
R104 4.7K
R102 330K
R103 10K
D116 10D1
D101 10D1
TR101
TR102
2SC945 x 4
TR103
TR104
VR101 30KB
VR102 10KB
RL104
RL101
C108 0.1/350
R105 4.7K
R106 330K
R107 4.7K
AKAI KD-A1001A

SERVOMOTOR CONTROL P.C. BOARD (KD-1087)

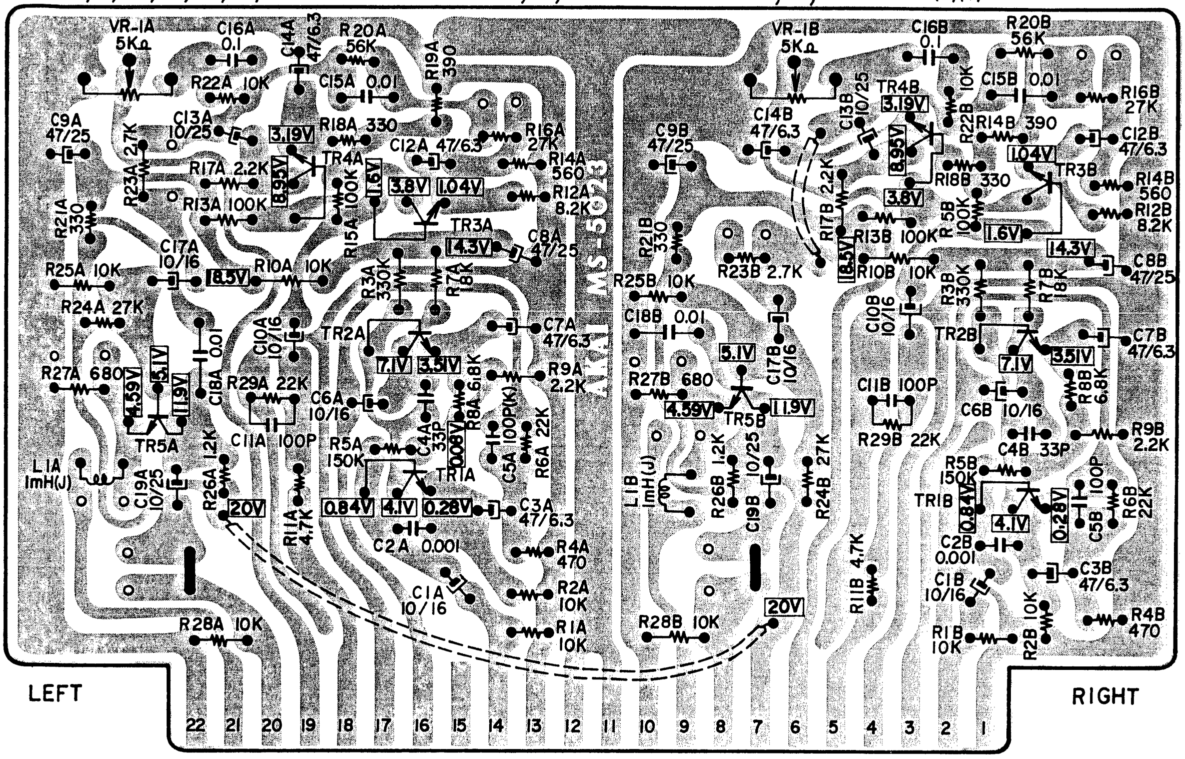

20V
+B
A.M.P.
E
AC
AC
D252
10DC-1(RED)
D251
10DC-1(BLACK)
R256
1/2W 47
C255
22/25
C254
470/25
C251
330/50
C253
220/35
C215
33/6.3
R225
1K
C252
330/50
RD9A
TR253
2SC968(3)(4)
R252
330
R251
22K
24.9V
TR252
2SD234
8.4V
25.2V
TR251
2SC1013
9.0V
32.2V
TR207
2SC711(D)(F)
R228
51
R253
2.7K
D253
TR208
2SC945(R)(S)
0.56V
2.8V
2.2K
0.60V
0.88V
R255
1.2K
R254
2.2K
+24V
TR209
2SD234(Y)
R224
1K
R223
2.2K
0.79V
R218
4.7K
R219
2.2K
R221
5.6K
1.31V
VR251
1KB
24V
12.3V
R222
2.2K
R214
4.7K
R211
150
C213
22/25
R227
15K
TR206
2SC711(G)(F)
0.33V
3.67V
R220
100
TH201
41D26
R217
15K
D204
10D1
1.22V
C210
0.05/50
0.96V
R213
9.1V
R212
10K
R209
100K
C205
10/16
R202
1.8K
C203
22/16
R204
22K
6.5V
4V
C209
220P
TR203
2SC711(D)(E)
C206
0.0015
R206
10K
2.2K
10.9V
11.5V
L201
A
10D1
10D1
R210
2.2K
0.44V
23.5V
C201
0.1
D202
D201
TR205
2SA564(R)
R203
TR204
2SC711(D)(E)
R205
10K
11.2V
TR201
2SC711(D)(E)
24.2V
C211
0.27/50
11.6V
23.9V
TR202
2SA564(R)
C202
0.056
VR202
5KB
R226
10
C207
100/25
C208
22/25
R208
47
R207
10K
C204
0.0039
R201
10K
AKAI
KD

OSCILLATOR P.C. BOARD (KF-5010)


L1
OT-204
1
2
3
4
5
6
7
8
9
C4
4500P/500
C3
47/25
R3
100
C1
0.01
C2
0.01
20V
-0.55V
0.43V
TR1
2SC911(2)(3)
20V
-0.55V
0.43V
TR2
2SC911(2)(3)
R1
3.3
R5
4.7K
R4
470
R2
3.3
TC1
50~70P
RL2
TECK-19
RL1
TECK-19
TC3
50~70P
TC2
50~70P
TC4
50~70P
AKAI
KF
5010
L2
1.2mH
C5
0.0022
C6
0.0022
L3
1.2mH
D1
10D1
L5
1.2mH
C8
0.0022
C7
0.0022
L4
1.2mH
1
2
3
4
5
6
7
8
9
10
11
12
13
14

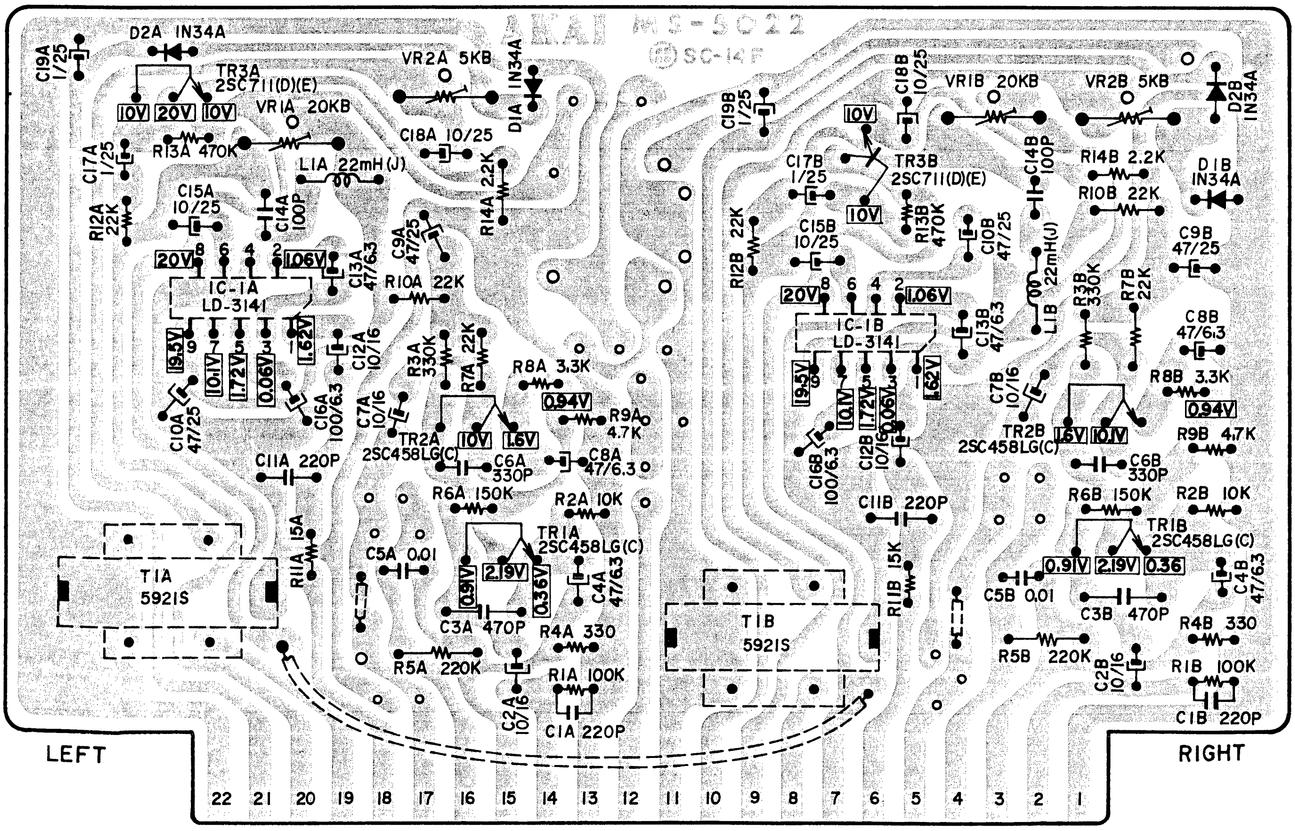
RECORDING AMP. P.C. BOARD (MS-5023)

TR1A,1B, 2A,2B,3A,3B,---2SC458(LG)   TR4A,4B,---2SC711   TR5A,5B,---2SC968(2)(3)



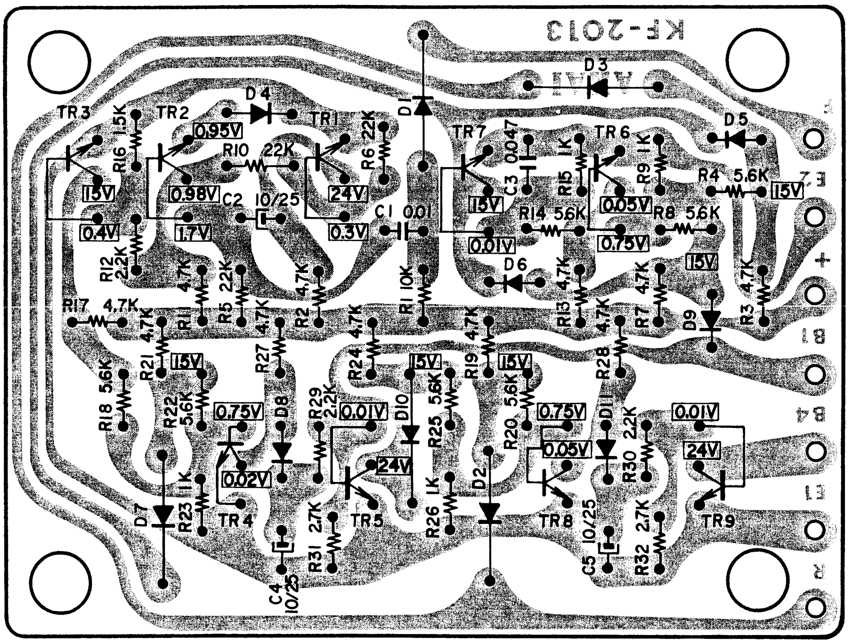
VR-1A 5KΩ
C16A 0.1
C14A 47/6.3
R20A 56K
R19A 390
R22A 10K
C15A 0.01
C9A 47/25
C13A 10/25
3.19V
R18A 330
R16A 27K
C12A 47/6.3
R14A 560
R12A 8.2K
R23A 2.7K
R17A 2.2K
8.95V
TR4A
1.6V
3.8V
1.04V
R13A 100K
R15A 100K
TR3A
14.3V
C8A 47/25
R21A 330
C17A 10/16
R25A 10K
18.5V
R10A 10K
R3A 330K
R7A 18K
R24A 27K
C10A 10/16
C18A 0.01
TR2A
C7A 47/6.3
7.1V
3.51V
R27A 680
4.59V
5.1V
11.9V
R29A 22K
C6A 10/16
R8A 6.8K
R9A 2.2K
C11A 100P
C4A 33P
C5A 100P(K)
R6A 22K
TR5A
R5A 150K
0.08V
L1A 1mH(J)
C19A 10/25
R26A 1.2K
20V
R11A 4.7K
0.84V
4.1V
0.28V
TR1A
C3A 47/6.3
C2A 0.001
R4A 470
C1A 10/16
R2A 10K
R28A 10K
R1A 10K
AKAI MS-5023
VR-1B 5KΩ
C16B 0.1
R20B 56K
C15B 0.01
R16B 27K
C14B 47/6.3
C13B 10/25
TR4B
3.19V
R22B 10K
R14B 390
C12B 47/6.3
C9B 47/25
8.95V
1.04V
TR3B
R14B 560
R18B 330
R12B 8.2K
3.8V
R5B 100K
R17B 2.2K
R13B 100K
1.6V
R21B 330
14.3V
C8B 47/25
R23B 2.7K
18.5V
R10B 10K
R3B 330K
R7B 18K
R25B 10K
C10B 10/16
C18B 0.01
TR2B
C7B 47/6.3
5.1V
C17B 10/16
7.1V
3.51V
R27B 680
C11B 100P
R8B 6.8K
4.59V
TR5B
11.9V
C6B 10/16
R29B 22K
R9B 2.2K
C4B 33P
L1B 1mH(J)
R26B 1.2K
C19B 10/25
R24B 27K
R5B 150K
TR1B
0.84V
4.1V
0.28V
C5B 100P
R6B 22K
R11B 4.7K
C2B 0.001
C3B 47/6.3
C1B 10/16
R28B 10K
20V
R1B 10K
R2B 10K
R4B 470
LEFT
RIGHT
22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

PLAYBACK AMP. P.C. BOARD (MS-5022)



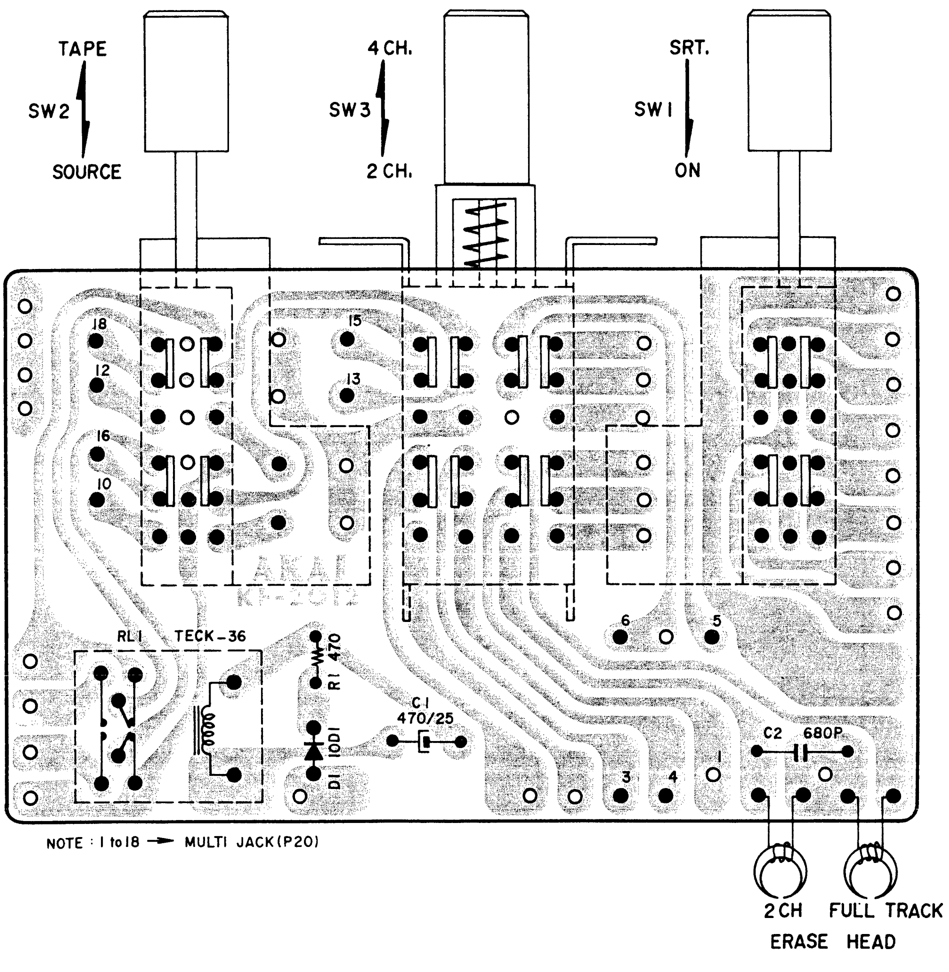
AKAI MS-5022
SC-14F
C19A 1/25
D2A IN34A
TR3A 2SC711(D)(E)
10V 20V 10V
VR1A 20KB
VR2A 5KB
D1A IN34A
R13A 470K
C17A 1/25
C18A 10/25
L1A 22mH(J)
R14A 2.2K
R12A 22K
C15A 10/25
C14A 100P
C9A 47/25
20V 8 6 4 2 1.06V
C13A 47/6.3
IC-1A LD-3141
R10A 22K
19.5V 9 7 5 3 1.62V
10.1V
1.72V
0.06V
C12A 10/16
R3A 330K
R7A 22K
R8A 3.3K
0.94V
C10A 47/25
C16A 100/6.3
C7A 10/16
TR2A 2SC458LG(C)
10V
1.6V
R9A 4.7K
C6A 330P
C8A 47/6.3
C11A 220P
R6A 150K
R2A 10K
TR1A 2SC458LG(C)
R11A 15K
C5A 0.01
0.91V
2.19V
0.36V
C4A 47/6.3
T1A 5921S
C3A 470P
R4A 330
R5A 220K
R1A 100K
C2A 10/16
C1A 220P
C19B 1/25
C18B 10/25
VR1B 20KB
VR2B 5KB
D2B IN34A
10V
C17B 1/25
TR3B 2SC711(D)(E)
C14B 100P
R14B 2.2K
D1B IN34A
R12B 22K
C15B 10/25
10V
R13B 470K
C10B 47/25
R10B 22K
C9B 47/25
L1B 22mH(J)
20V 8 6 4 2 1.06V
IC-1B LD-3141
C13B 47/6.3
R3B 330K
R7B 22K
C8B 47/6.3
19.5V
10.1V
1.72V
0.06V
1.62V
C7B 10/16
R8B 3.3K
0.94V
TR2B 2SC458LG(C)
1.6V
10.1V
R9B 4.7K
C16B 100/6.3
C12B 10/16
C6B 330P
C11B 220P
R6B 150K
R2B 10K
TR1B 2SC458LG(C)
0.91V
2.19V
0.36
C4B 47/6.3
R11B 15K
C5B 0.01
C3B 470P
T1B 5921S
R4B 330
R5B 220K
R1B 100K
C2B 10/16
C1B 220P
LEFT
RIGHT
22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

AUTOMATIC REPEAT P.C. BOARD (KF-2013)


KF-2013
AKAI
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
R1 10K
R2 4.7K
R3 4.7K
R4 5.6K
R5 22K
R6 22K
R7 4.7K
R8 5.6K
R9 1K
R10 22K
R11 4.7K
R12 2.2K
R13 4.7K
R14 5.6K
R15 1K
R16 1.5K
R17 4.7K
R18 5.6K
R19 4.7K
R20 5.6K
R21 4.7K
R22 5.6K
R23 1K
R24 4.7K
R25 5.6K
R26 1K
R27 4.7K
R28 4.7K
R29 2.2K
R30 2.2K
R31 2.7K
R32 2.7K
C1 0.01
C2 10/25
C3 0.047
C4 10/25
C5 10/25
0.95V
0.98V
15V
0.4V
1.7V
24V
0.3V
0.01V
0.05V
0.75V
0.02V
E2
+
B1
B4
E1
R

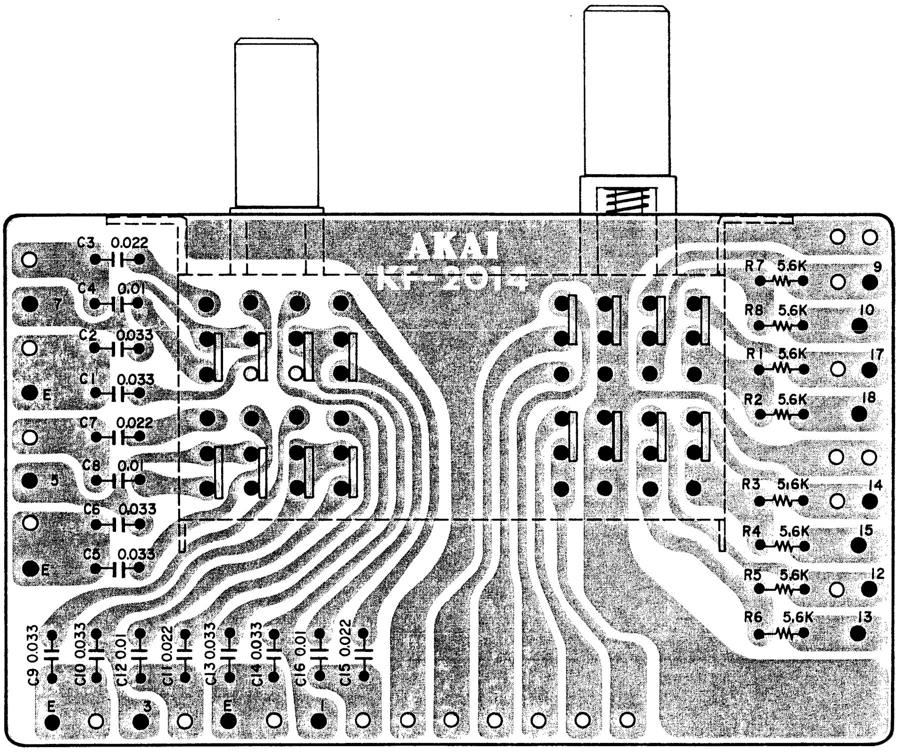
TR1~9---2SC945(R)(Q)
D 1~11---1N34A

MODE SWITCH P.C. BOARD (KF-2012)


TAPE
SW2
SOURCE
4 CH.
SW3
2 CH.
SRT.
SW1
ON
18
12
16
10
15
13
AKAI
KF-2012
RL1
TECK-36
R1 470
D1 10D1
C1
470/25
6
5
3
4
1
C2
680P
2CH
FULL TRACK
ERASE HEAD

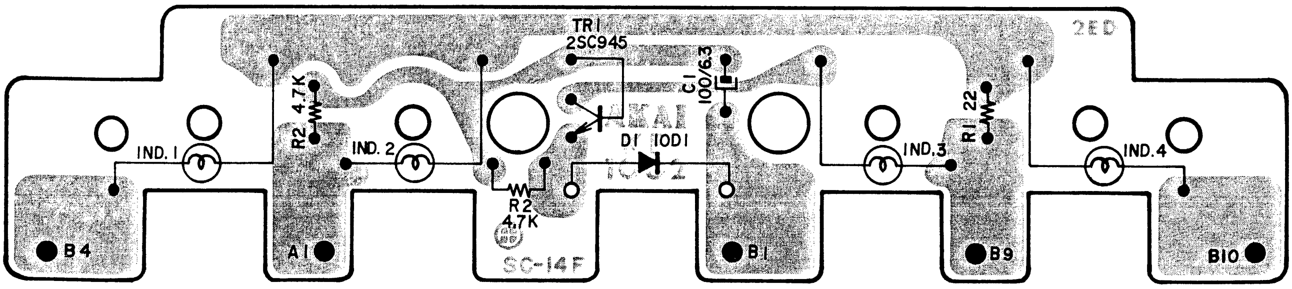
NOTE : 1 to18 → MULTI JACK(P20)

EQUALIZER SWITCH P.C. BOARD (KF-2014)

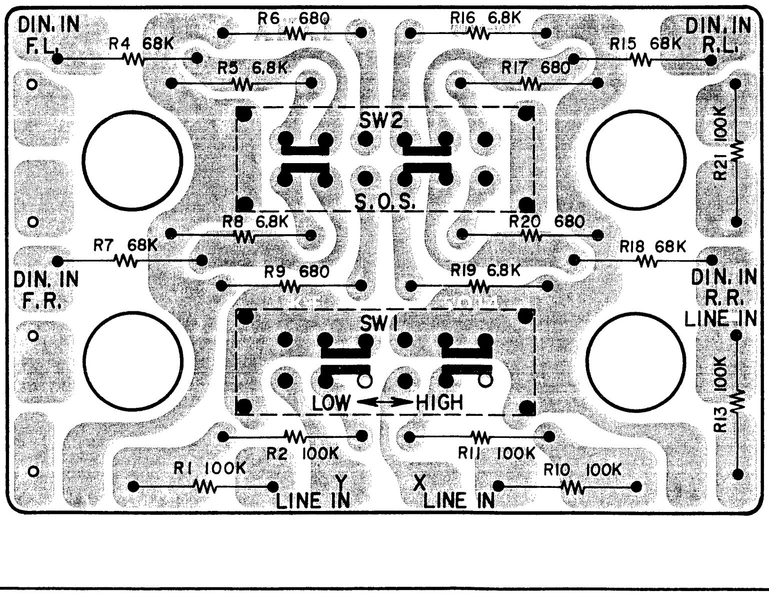

AKAI
KF-2014
C3 0.022
C4 0.01
7
C2 0.033
C1 0.033
E
C7 0.022
C8 0.01
5
C6 0.033
C5 0.033
E
C9 0.033
C10 0.033
C12 0.01
C11 0.022
C13 0.033
C14 0.033
C16 0.01
C15 0.022
E
3
E
R7 5.6K
9
R8 5.6K
10
R1 5.6K
17
R2 5.6K
18
R3 5.6K
14
R4 5.6K
15
R5 5.6K
12
R6 5.6K
13

NOTE : 1 to 18 → MULTI JACK(P18)

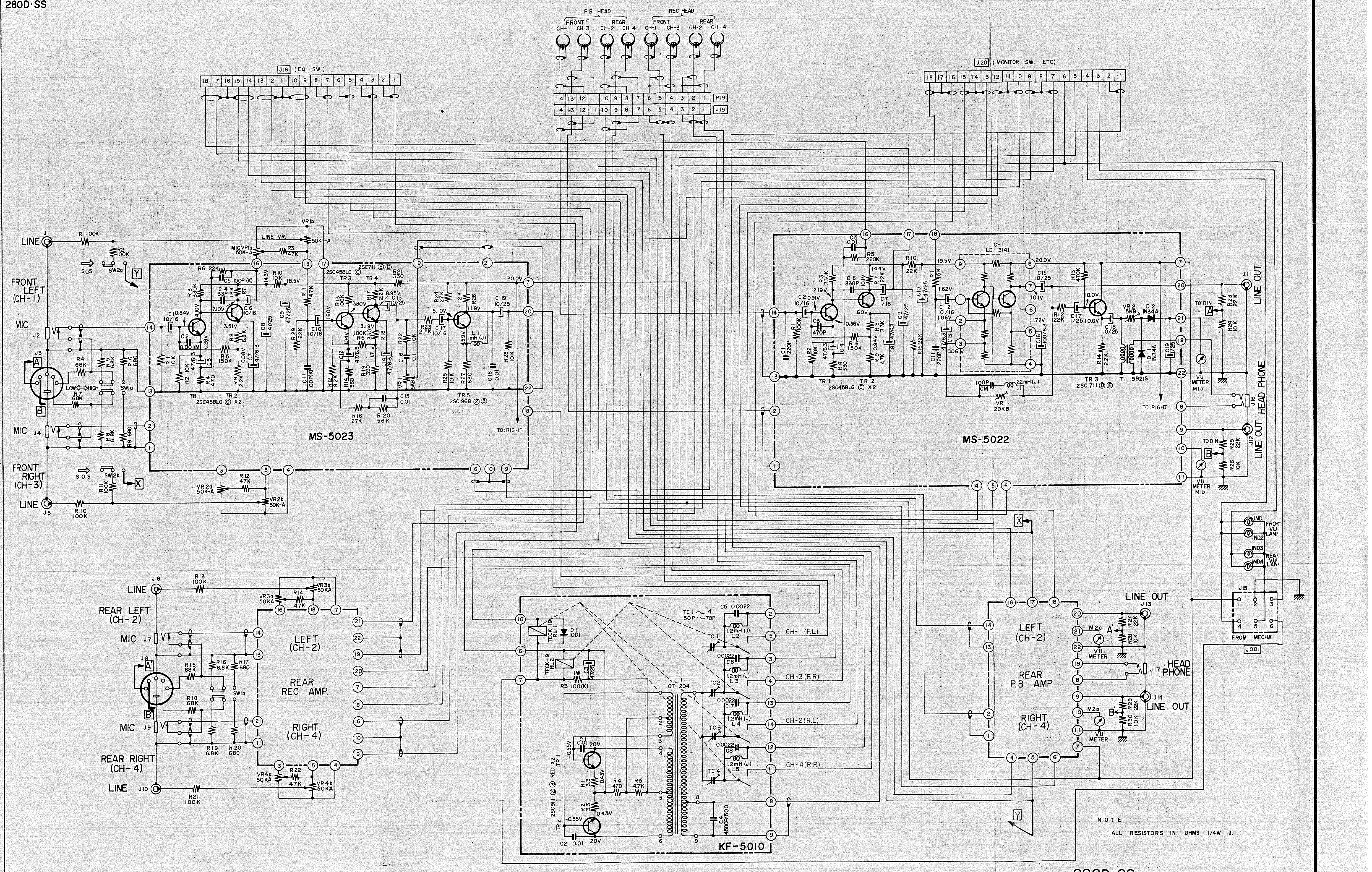
OPERATION LAMP P.C. BOARD (KF-1002)


TR1
2SC945
C1
100/6.3
R2 4.7K
IND. 1
IND. 2
D1 10D1
R2
4.7K
IND.3
R1 22
IND.4
B4
A1
B1
B9
B10
SC-14F
2ED

LINE JACK P.C. BOARD (KF-5014)


DIN. IN
F.L.
R4 68K
R6 680
R5 6.8K
R16 6.8K
R17 680
R15 68K
DIN. IN
R.L.
SW2
S.O.S.
R21 100K
R8 6.8K
R20 680
R7 68K
R18 68K
DIN. IN
F.R.
R9 680
R19 6.8K
DIN. IN
R.R.
LINE IN
SW1
LOW ◄─► HIGH
R13 100K
R2 100K
R11 100K
R1 100K
R10 100K
Y
LINE IN
X
LINE IN

280D·SS

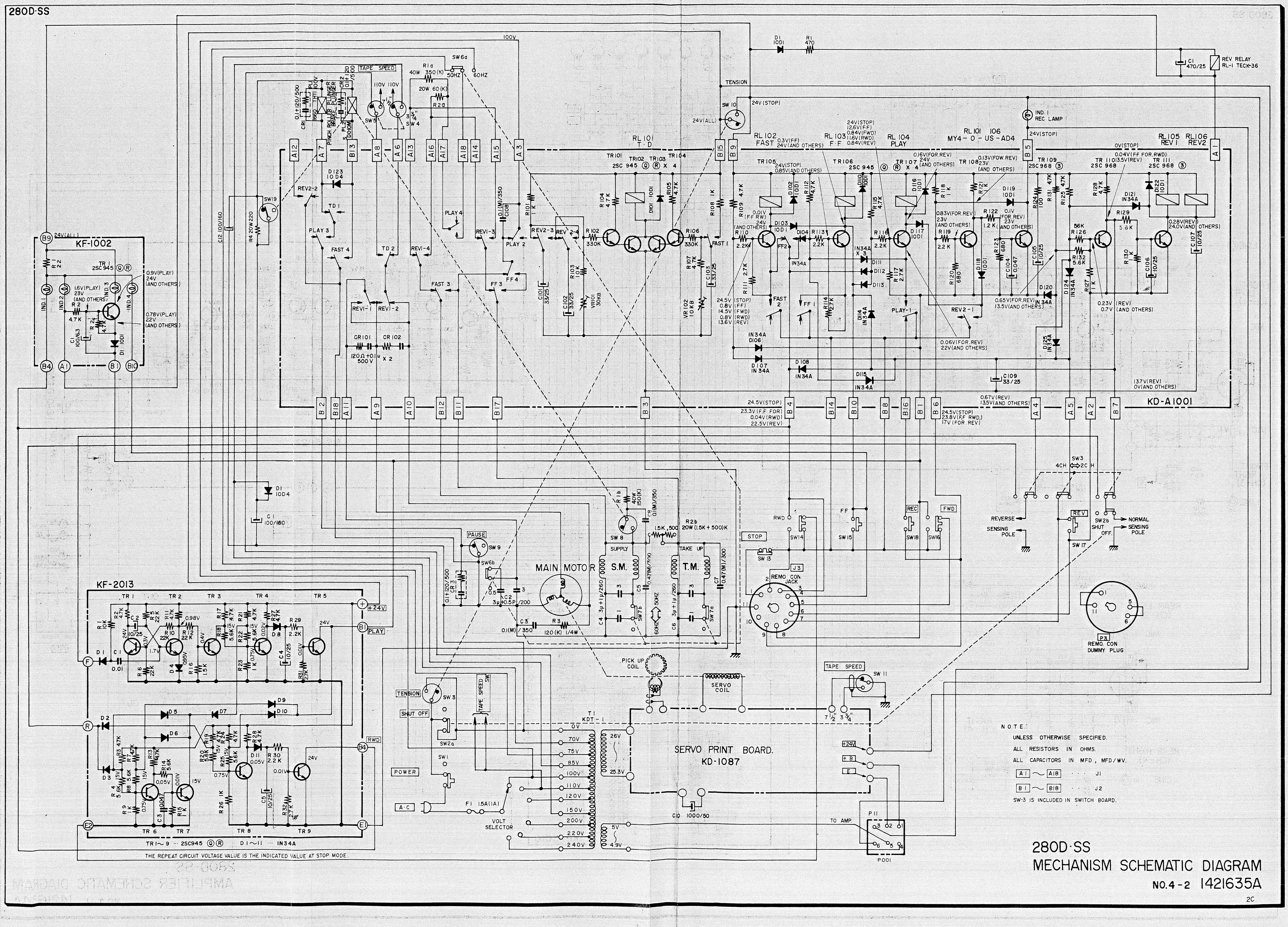

P.B HEAD
REC HEAD
FRONT
REAR
CH-1
CH-3
CH-2
CH-4
P19
J19
J18 (EQ. SW.)
J20 (MONITOR SW. ETC)
LINE
J1
R1 100K
R2 100K
S.O.S
SW2a
Y
FRONT LEFT (CH-1)
MIC
J2
J3
A
B
LOW
HIGH
SW1a
J4
FRONT RIGHT (CH-3)
SW2b
X
J5
R10 100K
LINE VR.
VR1b 50K-A
MIC VR1a 50K-A
R3 47K
TR 1
TR 2
2SC458LG © X2
TR 3
TR 4
2SC458LG ©
2SC711 Ⓔ Ⓓ
TR 5
2SC968 ② ③
20.0V
TO:RIGHT
MS-5023
VR 2a 50K-A
VR 2b 50K-A
R12 47K
MS-5022
C-1 LC-3141
TR 3 2SC711 Ⓓ Ⓔ
T1 5921S
VR 1 20KB
22mH (J) L1
D1 IN34A
D2 IN34A
VR 2 5KB
TO DIN
TO:RIGHT
J11 LINE OUT
J16 HEAD PHONE
J12 LINE OUT
VU METER M1a
VU METER M1b
IND1
IND2
FRONT VU LAMP
IND3
IND4
REAR VU LAMP
J15
FROM MECHA
J001
LINE
J6
R13 100K
REAR LEFT (CH-2)
MIC
J7
J8
J9
SW1b
REAR RIGHT (CH-4)
J10
R21 100K
VR3a 50KA
VR3b 50KA
R14 47K
VR4a 50KA
VR4b 50KA
R22 47K
LEFT (CH-2)
REAR REC. AMP.
RIGHT (CH-4)
TECK-19 RL1
TECK 19 RL2
D1 10D1
R3 100 (K)
2SC911 ② ③ RED X2 TR1
TR 2
L1 OT-204
TC1 ~ 4 50P ~ 70P
C5 0.0022
1.2mH (J)
CH-1 (F.L)
CH-3 (F.R)
CH-2 (R.L)
CH-4 (R.R)
C4 4500P/500
KF-5010
LINE OUT
J13
M2a VU METER
J17 HEAD PHONE
J14 LINE OUT
M2b VU METER
LEFT (CH-2)
REAR P.B. AMP
RIGHT (CH-4)
Y

NOTE

ALL RESISTORS IN OHMS 1/4W J.

280D·SS
AMPLIFIER SCHEMATIC DIAGRAM

NO.4-1 142163-4A


280D·SS
KF-1002
KF-2013
KD-A1001
RL101 T·D
RL102 FAST
RL103 F·F
RL104 PLAY
RL101 ~ 106 MY4-0-US-AD4
RL105 REV1
RL106 REV2
REV RELAY RL-1 TECK-36
TR101 TR102 TR103 TR104 2SC945 Ⓠ Ⓡ × 4
TR105 TR106 TR107 TR108 2SC945 Ⓠ Ⓡ × 4
TR109 2SC968 ③
TR110 2SC968
TR111 2SC968 ③
IND.1 REC LAMP
TENSION
SW10
TAPE SPEED
SW6a 50HZ 60HZ
SW5 SW4 110V
PINCH ROLLER PLUNGER
BRAKE PLUNGER
MAIN MOTOR
S.M. SUPPLY
T.M. TAKE UP
SW8
SW9 PAUSE
SW6b
PICK UP COIL
SERVO COIL
SERVO PRINT BOARD. KD-1087
T1 KDT-1
VOLT SELECTOR
POWER
A·C
F1 1.5A(1A)
TENSION
SHUT OFF
SW3
SW2a
SW1
TAPE SPEED SW
SW11 7½" 3¾"
TO AMP
P11
P001
STOP SW13
RWD SW14
FF SW15
REC SW18
FWD SW16
REV SW17
SW3 4CH 2CH
REVERSE SENSING POLE
SW2b SHUT OFF.
NORMAL SENSING POLE
J3 REMO CON JACK
P3 REMO. CON DUMMY PLUG
C10 1000/50
TR1~9 ··· 2SC945 Ⓠ Ⓡ
D1~11 ··· IN34A
+24V
PLAY
RWD

THE REPEAT CIRCUIT VOLTAGE VALUE IS THE INDICATED VALUE AT STOP MODE.

NOTE:

UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS IN OHMS.

ALL CAPACITORS IN MFD, MFD/WV.

A1 ~ A18 ··· J1

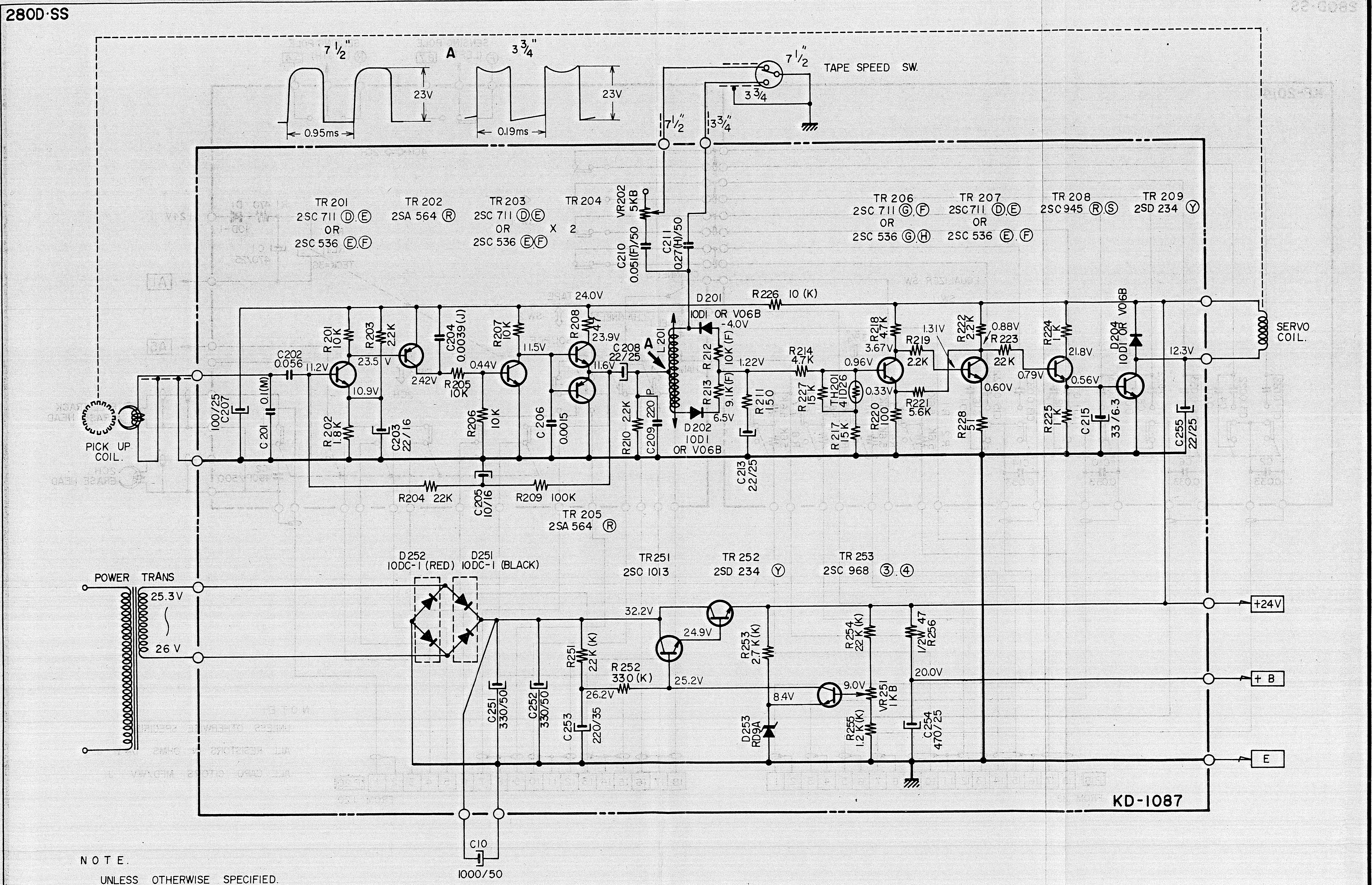
B1 ~ B18 ··· J2

SW-3 IS INCLUDED IN SWITCH BOARD.

280D·SS
MECHANISM SCHEMATIC DIAGRAM

NO.4-2 1421635A

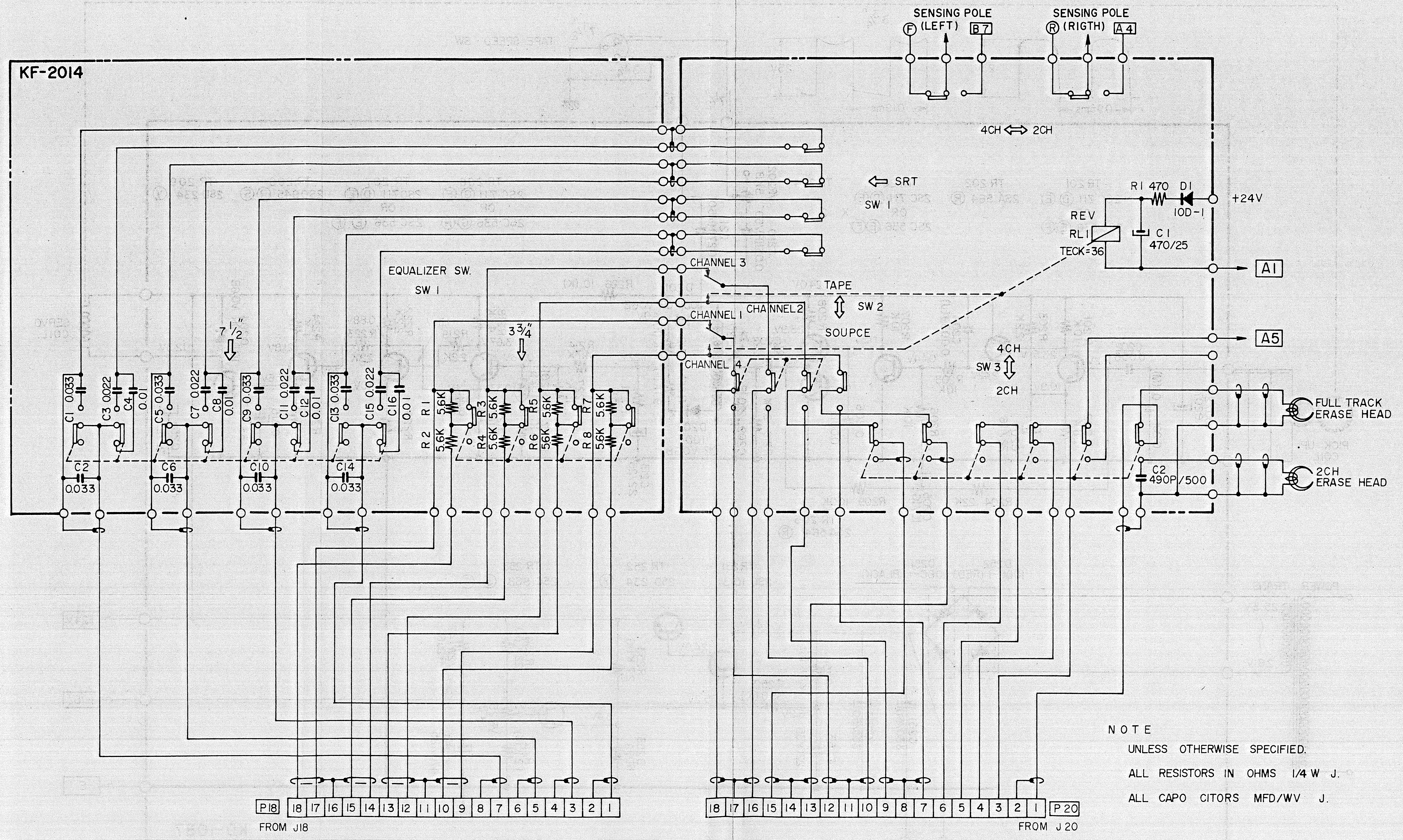
2C


280D·SS
A
7 1/2"
3 3/4"
23V
23V
0.95ms
0.19ms
7 1/2
3 3/4
TAPE SPEED SW.
7 1/2"
3 3/4"
TR 201
2SC 711 Ⓓ.Ⓔ
OR
2SC 536 Ⓔ.Ⓕ
TR 202
2SA 564 Ⓡ
TR 203
2SC 711 Ⓓ.Ⓔ
OR
2SC 536 Ⓔ.Ⓕ
X 2
TR 204
VR202
5KB
C210
0.051(F)/50
C211
0.27(H)/50
TR 206
2SC 711 Ⓖ.Ⓕ
OR
2SC 536 Ⓖ.Ⓗ
TR 207
2SC711 Ⓓ.Ⓔ
OR
2SC 536 Ⓔ.Ⓕ
TR 208
2SC945 Ⓡ.Ⓢ
TR 209
2SD 234 Ⓨ
24.0V
D 201
10D1 OR V06B
-4.0V
R226 10 (K)
SERVO COIL.
C202
0.056
11.2V
R 201
10K
R 203
2.2K
23.5 V
C204
0.0039(J)
R 207
10K
R 208
47
23.9V
C208
22/25
L201
A
R 212
10K (F)
1.22V
R214
4.7K
0.96V
R218
4.7K
3.67V
R219
2.2K
1.31V
R222
2.2K
0.88V
R 223
22K
R224
1K
21.8V
D204
10D1 OR V06B
12.3V
11.5V
11.6V
0.44V
2.42V
R205
10K
10.9V
PICK UP COIL.
100/25
C207
C 201
0.1(M)
R 202
1.8K
C203
22/16
R206
10K
C 206
0.0015
R210
2.2K
C209
220
P
R 213
9.1K (F)
6.5V
D202
10D1
OR V06B
R 211
150
C213
22/25
R 227
15 K
TH201
41D26
R 217
15 K
R220
100
0.33V
R221
5.6K
R228
51
0.60V
0.79V
R225
1 K
0.56V
C 215
33/6.3
C255
22/25
R204 22K
C205
10/16
R209 100K
TR 205
2SA 564 Ⓡ
D252
10DC-1 (RED)
D251
10DC-1 (BLACK)
TR251
2SC 1013
TR 252
2SD 234 Ⓨ
TR 253
2SC 968 ③.④
POWER TRANS
25.3V
26 V
32.2V
24.9V
R251
22 K (K)
R 252
330 (K)
25.2V
26.2V
R253
2.7 K (K)
8.4V
D253
RD9A
R254
22 K (K)
9.0V
VR251
1 KB
R255
1.2 K (K)
47
1/2W
R256
20.0V
C254
470/25
C251
330/50
C252
330/50
C253
220/35
+24V
+ B
E
KD-1087
C10
1000/50

NOTE.
UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS IN OHMS 1/4 W (J).
ALL CAPACITORS IN MFD (K) 50WV, MFD/WV.

280D·SS SERVO SCHEMATIC DIAGRAM NO.4-3 1421636A

280D·SS


KF-2014
SENSING POLE
(F) (LEFT) B7
SENSING POLE
(R) (RIGTH) A4
4CH ⇔ 2CH
⇦ SRT
SW 1
R1 470
D1
10D-1
+24V
REV
RL1
TECK=36
C1
470/25
A1
A5
CHANNEL 3
TAPE
SW 2
CHANNEL 2
CHANNEL 1
SOUPCE
CHANNEL 4
4CH
SW 3
2CH
EQUALIZER SW.
SW 1
7 1/2"
3 3/4"
C1 0.033
C3 0.022
C4 0.01
C5 0.033
C7 0.022
C8 0.01
C9 0.033
C11 0.022
C12 0.01
C13 0.033
C15 0.022
C16 0.01
C2 0.033
C6 0.033
C10 0.033
C14 0.033
R1 5.6K
R2 5.6K
R3 5.6K
R4 5.6K
R5 5.6K
R6 5.6K
R7 5.6K
R8 5.6K
FULL TRACK
ERASE HEAD
2CH
ERASE HEAD
C2
490P/500
P18
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
FROM J18
18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
P20
FROM J20

NOTE

UNLESS OTHERWISE SPECIFIED.

ALL RESISTORS IN OHMS 1/4 W J.

ALL CAPO CITORS MFD/WV J.

280D·SS SWITCH BOARD SCHEMATIC DIAGRAM NO.4-4 1421637A

SYSTEM CONTROL P.C. BOARD I. (KDA-1001B)

For easy repair, patterns of both sides of this P.C. Board are shown in the Service Manual. By placing the transparent sheet on which (KD-A1001A) is shown over pattern (KD-A1001B) both sides can be seen at same time.